*ARTICLES on design, construction and operation of oil-engines and motorships by the world's foremost writers on marine engineering.*

# Motorship

*ILLUSTRATIONS of the newest designs in international merchant motorship and Diesel-engine construction and auxiliary equipment.*

*Trade Mark Registered. Contents copyright 1925 by Motorship*

Vol. X | New York, May, 1925 | No. 5

# Hawaiian Standard Is Now in Operation

## Third Motor Tanker of the Standard Oil Co. of Cal. Is Placed in the Inter-Island Hawaiian Service

EARLY last month the HAWAIIAN STANDARD reached Honolulu and completed a very successful maiden passage from San Francisco. She is a vessel of 1217 tons gross with a deadweight capacity of 1350 tons, 210 ft. in length b.p., 36 ft. molded beam and 16 ft. 6 in. depth. These dimensions show her to be slightly smaller than the STANDARD SERVICE and the ALASKA STANDARD, which are vessels of the same type owned by the Standard Oil Co. of Cal. On trial over a measured mile she showed an average speed of 9.9 knots, which was very close to the designed speed of 9¾ knots.

In this vessel the machinery has been placed amidships, a practice which has long been out of favor for tankships, but which is again being utilized since the adoption of Diesel engines for this class of vessel. This feature works out much better with the Diesel electric type of propulsion than it can with direct connected shafting, because no shaft alley is required between the engine room amidships and motor room right aft.

With the electric cargo pumps it is possible, when the pump room is placed immediately adjacent to the engine room, to keep the electric motors in the engine room whilst the pumps are located in the pump room. This is in line with modern practice ashore where oil pumps are confined in a separate space, the driving machinery always being bulkheaded off. For the purpose of leading the cargo pipes from the forward tanks into the pump room and eliminating the possibility of gas escaping into the engine room, there is a gas tight pipe tunnel through the engine room below the floor plates.

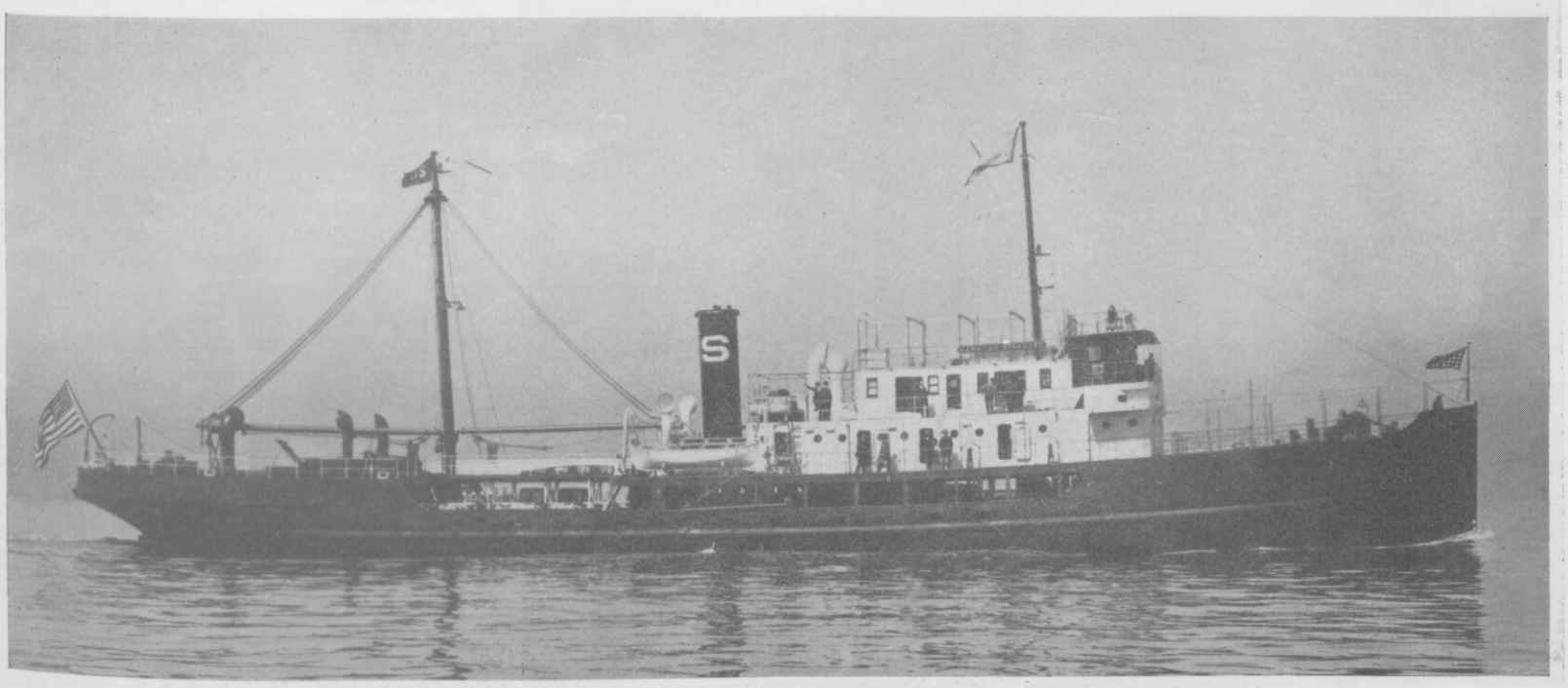
Between the engine room amidships and the motor room aft there are three cargo tanks and a small cargo hold. Forward of the engine room there are four cargo tanks separated into pairs by a cofferdam, in order to permit transportation of different grades of oil. To assist in trimming the vessel there is a large ballast tank forward, in addition to the forepeak. Fuel oil for the engine is carried in a double bottom beneath the engine room. With this arrangement, in conjunction with four cargo oil pumps, it is possible to load or discharge four grades of oil at the same time.

For power purposes there are two 400 hp. 4-cylinder Pacific-Werkspoor engines turning at 225 r.p.m. and direct connected to two main generators of 245 kw. capacity each, and two exciters of 30 kw. capacity. The voltage of the exciters is 115 and that of the generators 230. This combination furnishes power for the 600 hp. 460 volt propelling electric motor which turns at 130 r.p.m. All the electrical machinery is of the General Electric type.

The main engines furnish power for all purposes on the ship. There is an auxiliary set of 7 hp. connected with a 2-stage Rix air compressor, but this is only for pumping up the pressure in the starting air and injection air tanks after a survey or overhaul, when all the pressure has been released. This little set can also drive a small auxiliary generator to keep the lights going when the vessel is laid up.

At sea the main engines supply power almost solely for propulsion, for the Hyde electric hydraulic steering engine and for the lighting. There is an electric fire and bilge pump set, but this is only used as an auxiliary, each main engine having a bilge pump attached, while in the motor room aft there is a bilge pump operated directly from the propeller shaft. Electricity is used also for the fuel oil transfer pump and for the sanitary and heating system pumps. In port the power from the main engines is utilized for the cargo pumps in addition to the ship's service. This constant use of the main engines makes for efficiency in operation and has undoubtedly been one of the determining factors in the selection of the Diesel electric type of propulsion for these tankers.

In the HAWAIIAN STANDARD, as in the two




*Hawaiian Standard, third Diesel electric tanker of the Standard Oil Co. of California, has been commissioned*

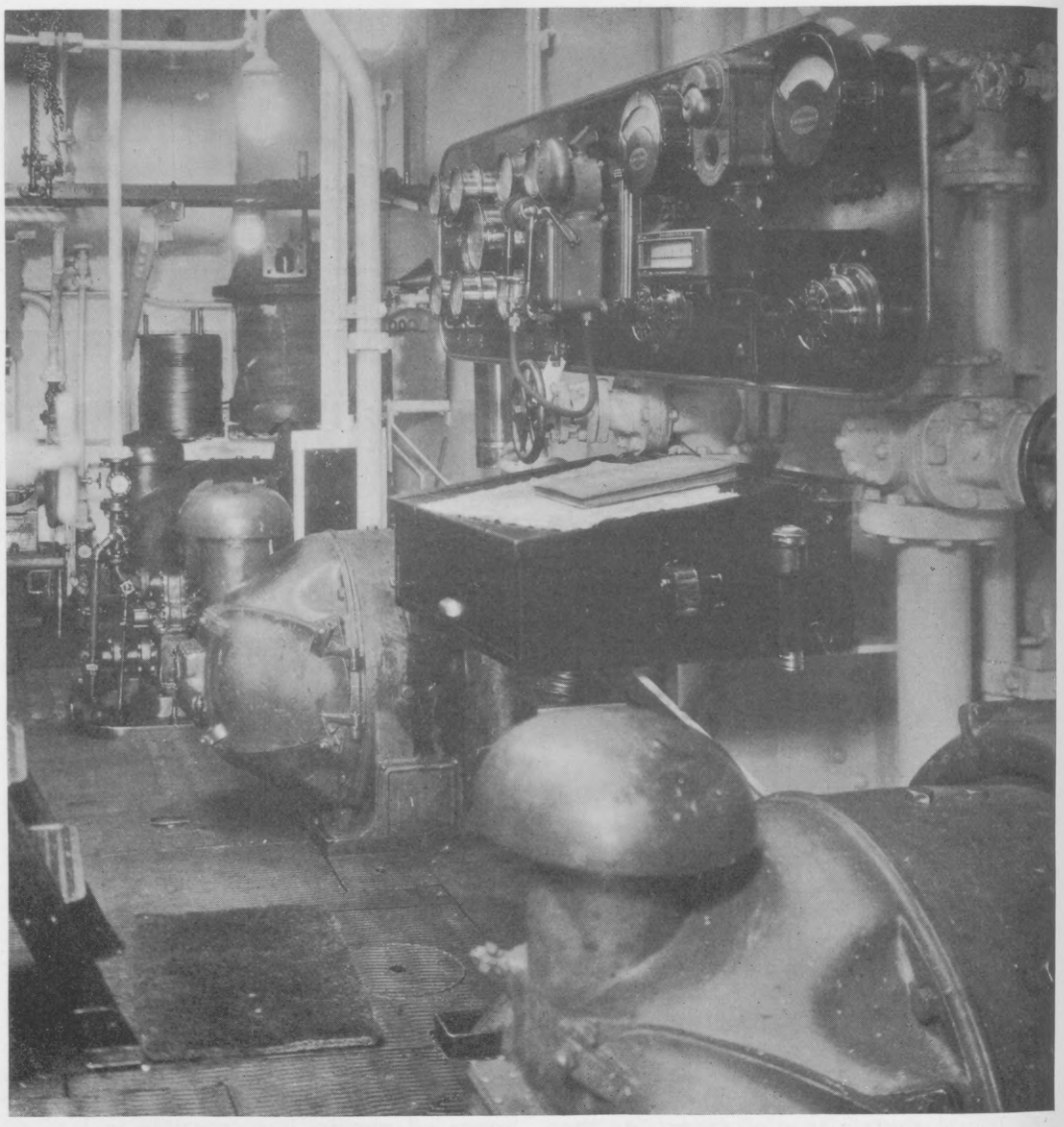
Generated on 2024-09-13 15:40 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN

other motor tankers belonging to the same owners, the control of the propelling power is given to the navigating officer. Whilst the Diesel engines run at constant speed and always in the same direction, the navigating officer can regulate the speed of the propelling motor and its direction of rotation. This has proved very satisfactory in the other vessels. It has been shown possible to keep the propeller speed indefinitely at any figure from one revolution per minute upwards. The controller is so arranged in the pilot house that the propeller speed is always proportionate to the position of the control lever.

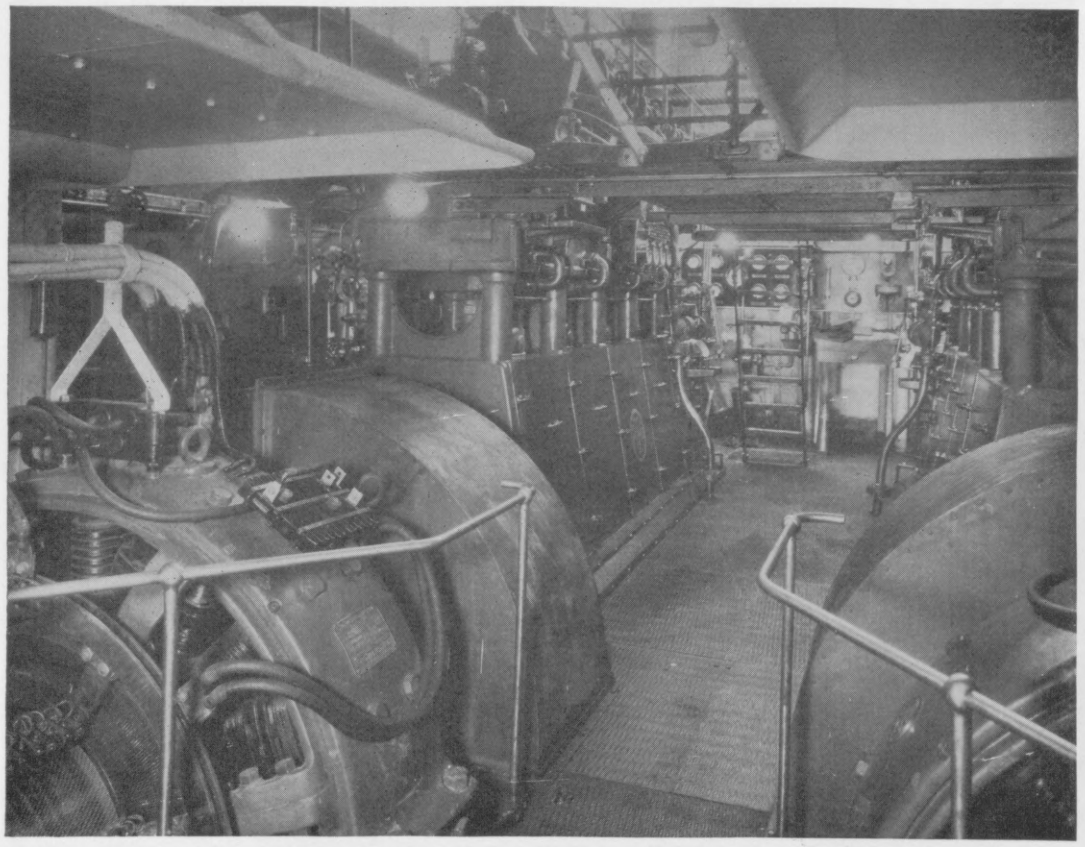
Use is made of the exhaust gases for heating purposes. They can be bypassed from the main engines to a tubular heater, composed simply of a shell in which there are a number of interconnected water pipes. The exhaust gases heat this water, which is then pumped through the radiator system and hot water supply piping over the ship. A tank located above the heater is a safeguard against the pipes being burnt on account of the system running dry.

The switchboard is located on the port side of the engine room forward on a platform raised 12 in. above the engine room floor. On the starboard side forward an engineers' workshop is provided.

Experience gained with the first two Diesel-electric tankers of this company has confirmed the faith of its marine department in the advantages of this system of propulsion for the coastwise operation of vessels of this class and size. What is really achieved in this design in a manner that cannot be paralleled by any other machinery arrangement is the operation of the ship by electricity generated in a compact, dependable and economical power plant. If a direct Diesel drive were employed on the propeller the economy of propulsion would be much the same, but auxiliary Diesel sets would have to be installed to provide electric power for the ship's service and for the cargo pumps. That would mean not only additional machinery to care for, but also would entail the use of auxiliary engines of virtually excessive power, big enough to carry the cargo pump load but normally working at only a fraction of that load. Turbo-electric drive would not of course provide nearly the same economy of operation, but in other respects would make a good showing on paper. The Diesel electric system with its two compact prime movers is very elastic and maintains a remarkable degree of economy whether both sets are operating for the propulsion of the ship or one set only is working for the cargo handling. Furthermore, this efficiency is enduring; it does not decrease with each passing month as happens with steam plants. It is very clean, is free from fire dangers—an important feature in a tankship—and is very flexible in operation.



*Instrument board and engineer's desk between the cargo pump motors*



*Looking forward between the engines of the Hawaiian Standard*

HAWAIIAN STANDARD was built by the Bethlehem Shipbuilding Corporation, and credit goes to J. C. Rohlfs, manager of the marine department of The Standard Oil Co. of California, for the special features incorporated in the design.

---

Tenders for the construction of two motorships of about 13,000 tons displacement each are being invited by Grace Bros. & Co., Ltd., of London, the English connection of W. R. Grace & Co. of New York.

---

Construction of the Diesel-electric 20-inch pipeline dredge for the Philadelphia office of the Corps of Engineers has been awarded to the Newport News S. B. & D. D. Co. at a price of $815,000. The main engines to be furnished by the McIntosh & Seymour Corporation.

Generated on 2024-09-13 15:33 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN

# Converted JACKSONVILLE Ready for Service

## Former Shipping Board Steamer of 5500 tons d.w.c. Equipped with Diesel Engine of 1600 s.hp.

JACKSONVILLE, converted by the New York Shipbuilding Corporation of Camden, N. J., has just successfully finished her 3 days sea trial outside the Delaware Capes.

Built during the war for the Shipping Board in one of the Southern shipyards, the JACKSONVILLE represents now, after her conversion to direct Diesel drive, like her sister-ship ASHBEE, a vessel of medium size efficient for long distance trade. She will, however, run in the same coastwise trade which her sister vessel ASHBEE has been operating in for over a year very successfully and very economically.

As originally built, this vessel was a single deck, three island type bulk freighter constructed on the Isherwood system. A second deck now added makes her more adaptable to general trade conditions. Otherwise, with the exception of the necessary removal of foundations, etc., from the old engine and boiler room and of the reconstruction of new ones to suit, with also some modifications to casings and quarters in the bridge, the vessel structurally remains untouched. The new Diesel propelling plant occupies the same space as the original machinery.

The general particulars of this vessel are as follow:

| Deadweight capacity | *Steamship* | *Motorship* |
|---|---|---|
| Length overall | 346 ft. 6 in. | |
| Length b.p. | 334 ft. 6 in. | |
| Depth to upper deck | 27 ft. 6 in. | |
| Breadth molded | 48 ft. 0 in. | |
| Draft molded | 22 ft. 5½ in. | |
| Deadweight capacity (tons) | 5,740 | 5,532 |
| Bale capacity (cu. ft.) | 257,933 | 250,004 |
| Gross tonnage | 3,532 | 3,434 |
| Net tonnage | 2,151 | 2,147 |
| Fuel oil capacity (tons) | 1,179 | 868 |
| Reserve feed water (tons) | 221 | 157 |
| Shaft horsepower | 2,000 | 1,600 |
| Indicated horsepower | .... | 2,000–2,200 |
| R.p.m. of propeller | 90 | 110 |
| Service speed (knots) | 10.5 | 10 |
| Daily fuel consumption (tons) | 24.6 | 7.10 |
| Corresponding endurance (nau. miles) | 12,000 | 28,800 |

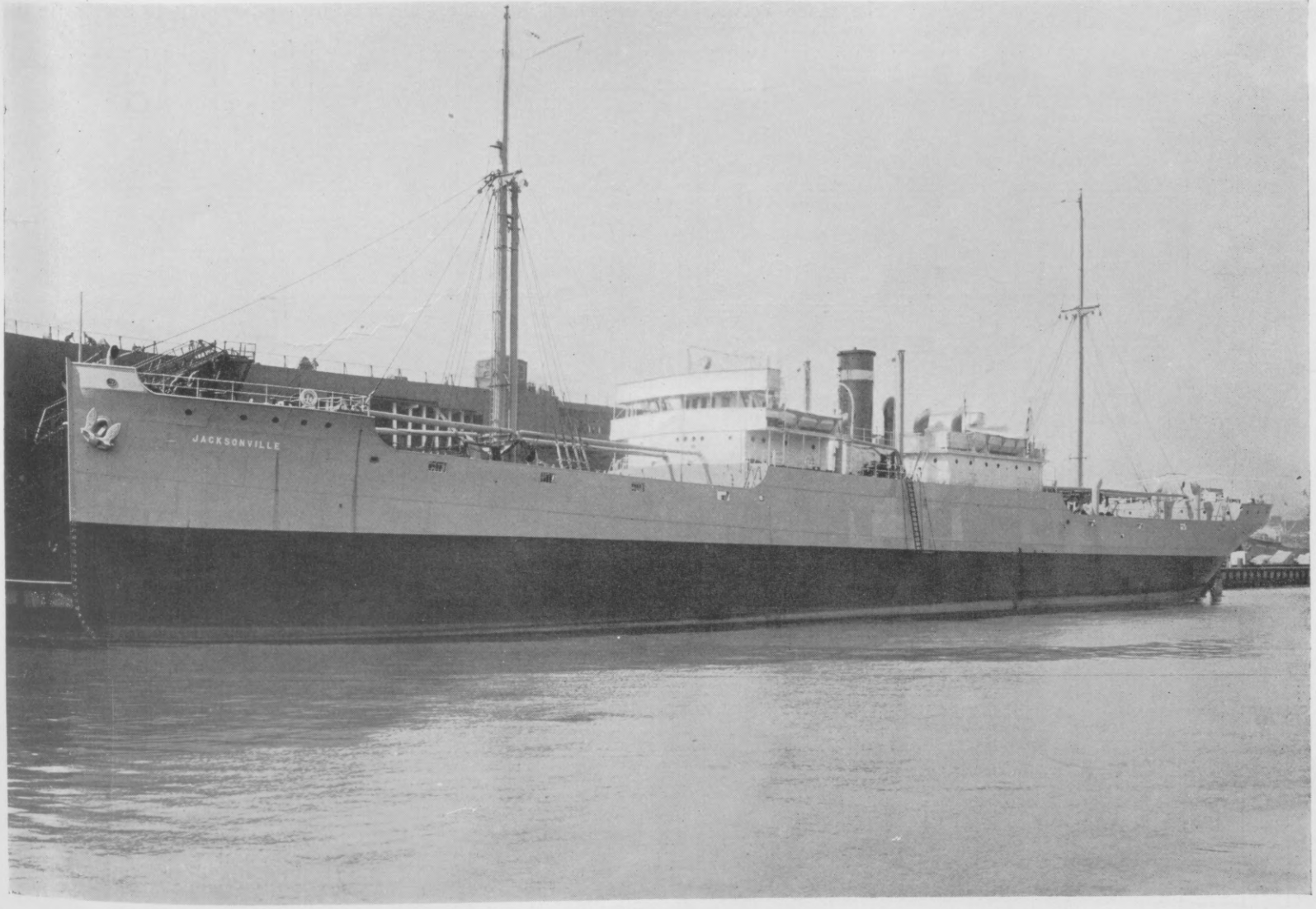
In the steamship the machinery plant consisted of water tube boilers, reduction geared turbines and the usual steam auxiliaries, steering gear, windlass and cargo winches. Of the original plant, the windlass and cargo winches alone remain. In the conversion jobs main interest centers itself around the propelling plant and deck machinery. As the deck machinery, except for the steering gear, remained untouched as just mentioned, the engine room really is the main feature in the conversion.

Her main propelling engine is of the 6-cylinder 4-cycle type known as the New York-Werkspoor Diesel engine, with 27 in. cylinder diameter and 47 in. stroke, developing 1600 b.hp. at 110 r.p.m.

It will be noted by those acquainted with the earlier Werkspoor types that the New York Shipbuilding Corporation has adopted a design more in line with late American and European engines, which make a stronger appeal to American shipowners.

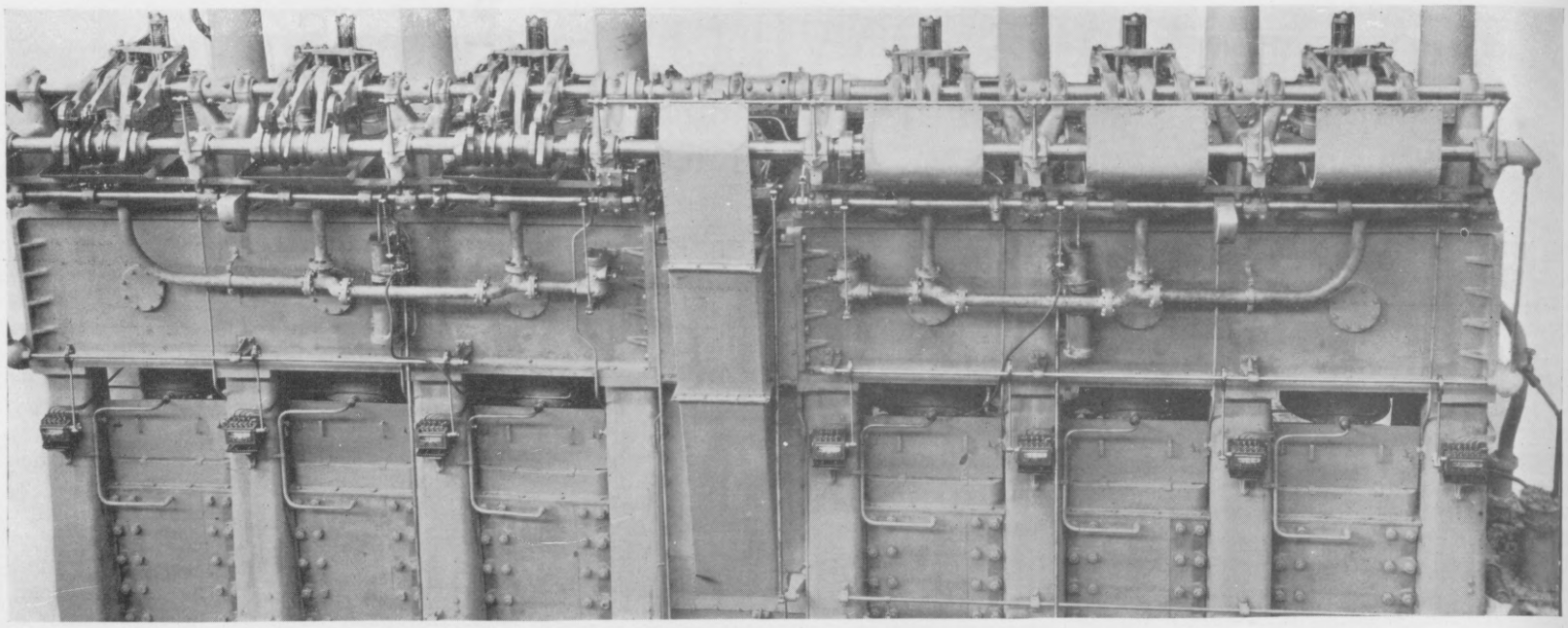
The engine bedplate is of cast iron, of the box and deep-girder design, built with a large factor of safety. The main bearing seats are of the square type, permitting shimming up on main bearings, if necessary, with the least possible manual labor. All that is necessary is to roll out the lower eccentrically turned brass and raise the bottom box up, an easy job.

The crankshaft is of the semi-built-up type, made in two halves bolted together with straight coupling bolts. Crankpin




*M. S. Jacksonville, a converted steamer which has just run trials and is to be operated by the Grace Line*

Generated on 2024-09-13 15:36 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN



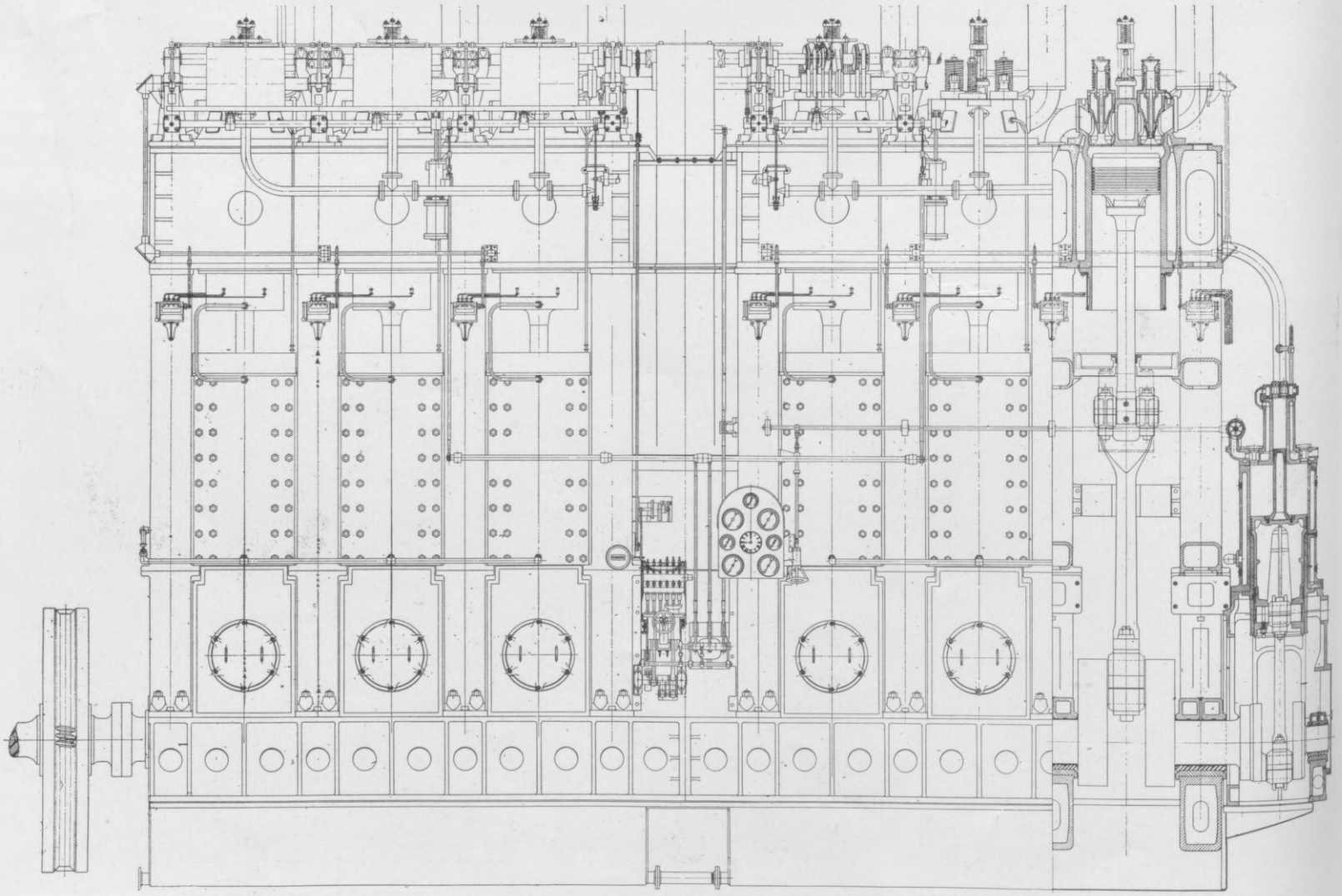
*Cylinder beam and valve gear of Jacksonville engine, with cam guards removed on three cylinders*

and webs are forged in one piece, a construction that saves weight without sacrificing strength. A separate crank of the solid disk-web type is bolted to the forward end of the main shaft, driving the 3-stage air-compressor, and the aft end is coupled to a multiple collar thrust shaft also has a collar seating for the fly-wheel.

Reciprocating parts follow the conventional marine style with running clearances conforming to Diesel practice and to New York Shipbuilding Corporation marine experience.

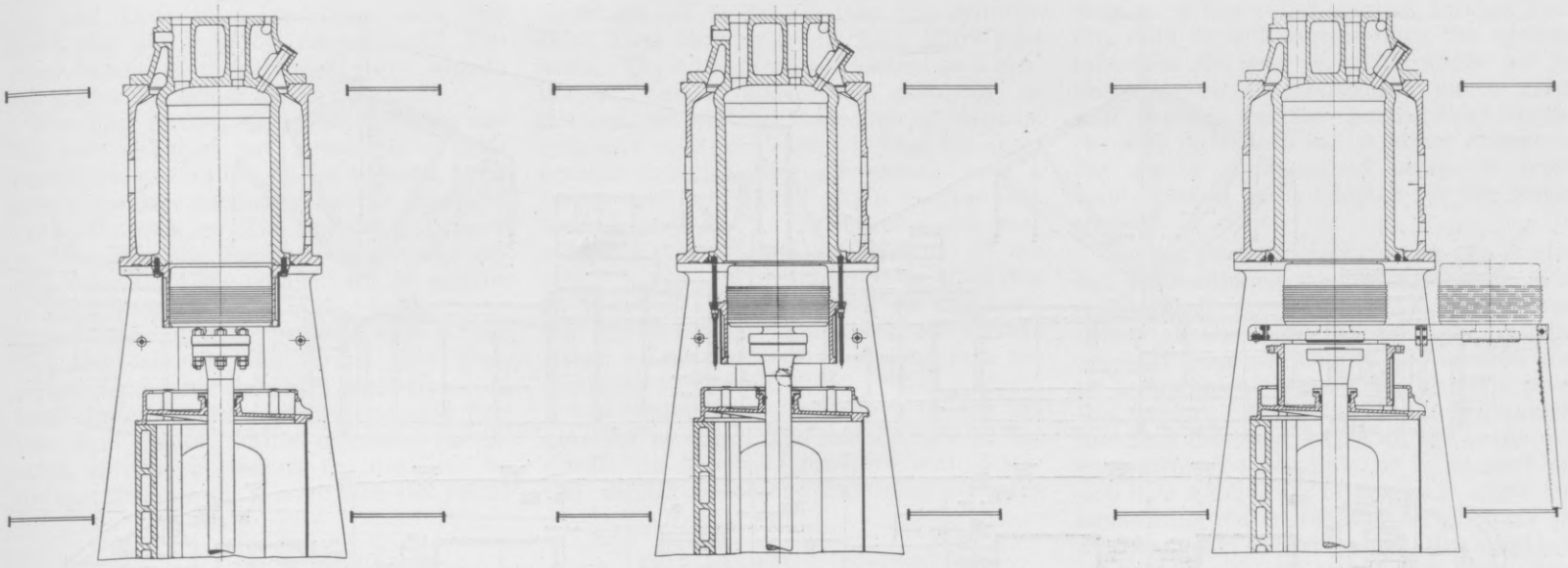
The crosshead and crosshead slipper construction differs somewhat from ordinary practice. As will be seen from the illustrations the piston rod is secured to the crosshead by a rectangular flange connection, instead of by the more conventional shoulder and nut. As no large hole is drilled in the crosshead block the full strength of the latter is not impaired. The ahead and astern guide have a fixed relation to each other and do not have to be touched for wear, because adjustment can be made between the crosshead and the ahead slipper. Separate independent adjustment between the ahead slipper and the astern slipper is also provided, a feature which will be appreciated by the operating engineers. The ahead and astern guide retain their original alignment as when installed.

All running gears are lubricated by a main force feed system, but no oil cooler is introduced. Tests carried out on the sister-ship ASHBEE under actual operating conditions in tropical climate showed a temperature rise of only 15 deg. F. in the



*Elevation and part section of six-cylinder 2200 i. hp. New York-Werkspoor engine of the converted motorship Jacksonville*

Generated on 2024-09-13 15:46 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN



*Diagrams illustrating method of removing piston from lower end of cylinder after removal of cylinder skirt*

lubricating system. This feature saves installation of an elaborate oil cooling system.

The engine is of the inclosed type consistent with modern practice and with forced lubrication throughout. Between the cast iron frames or housings oil-tight plates are fitted, the latter being provided with large inspection doors, which can be removed in a few seconds.

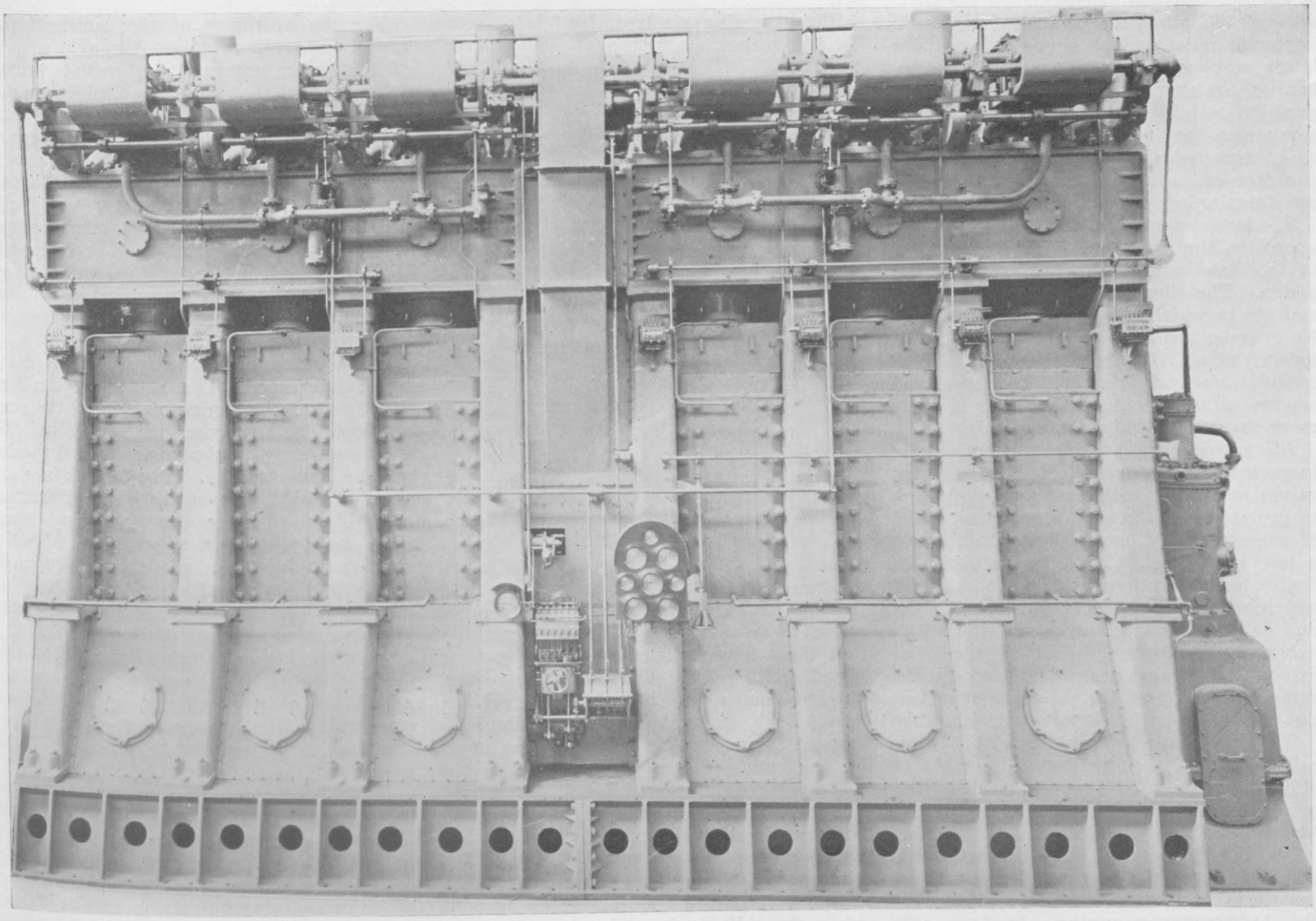
Frames and housings are of the box type in three parts, securely bolted together, a feature which enables a section of the main crankshaft to be rolled out if this should ever become necessary.

The usual New York Shipbuilding Corporation practice of fitting steel tie-rods from the bedplate to the upper side of the cylinder beam to secure complete relief in the housings, frames and cylinder beam from the stresses arising through the combustion pressure is adhered to.

The cylinder beam consists of two box-type girders, each accommodating three cylinders and joined in the middle by a distance piece on which the reversing engine is mounted. The space between the cylinder walls and the walls of the cylinder beam forms an ample water pocket or jacket.

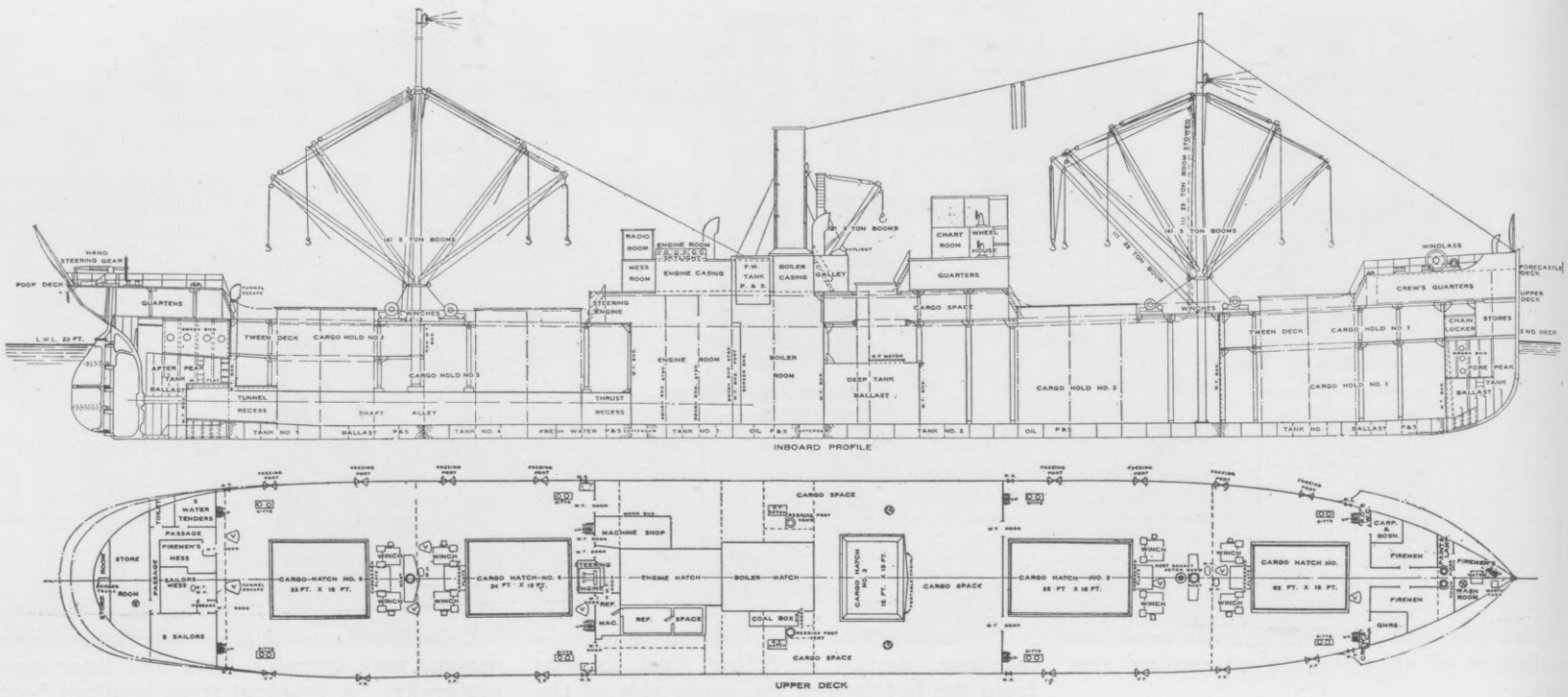
Cylinders are of the so-called mushroom design, with cylinder head and liner cast integrally. A freedom from localized heat spots is the main feature of this design, because it lends itself to a very effective water-cooling of the combustion chamber at points where this is most desired. For this very same reason the fuel valve is located off center.

The barrel or cylinder liner, turned smooth inside and outside, is a plain cylindrical casting of such thickness that, if time and conditions should warrant, it can be rebored and a special cast iron liner forced in. The whole design and construc-



*Jacksonville's main engine. The special features of which are described in the article about the conversion of this vessel*

Generated on 2024-09-13 15:39 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN




*Inboard profile and upper deck of the Jacksonville as originally built for the Shipping Board*

tion of this cylinder head and liner permit expansion in a lateral direction, and the very domed shape of the head and its flanged connections to the cylinder beam permits a flexibility that eliminates localizing of unknown stresses, which sometimes might develop after a certain period of time in operation, or due to foundry work, core shifting, etc., in places not easy checked by the machine shop or inspector.

The head has suitable openings for pockets for the air-inlet, exhaust, fuel, starting and relief valves respectively. The latter serve as safety valves for the combustion chamber as well as automatic compression reliefs when maneuvering. They carry also the indicator cocks. They are so constructed that during operation the engineer can investigate by hand if they are functioning properly.

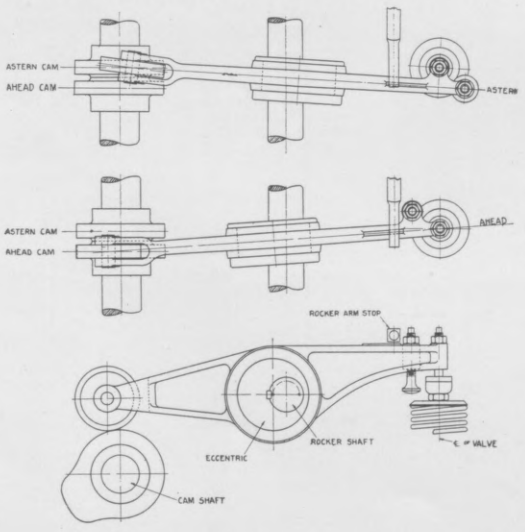
The lowest portion of the cylinder barrel, known as the skirt, is detachable in order to facilitate removal or inspection of the piston. The illustration clearly shows the manner in which the pistons are removed. No cylinder heads or valve gear have to be touched at all. By this device and method considerable work is saved. To inspect and replace all six pistons takes only a little more than one working day.

All valves have outside springs, easily inspected during operation. The exhaust valves are fitted with cast iron deflectors to protect stems from any injurious effect of gases and heat, especially when burning a low grade fuel. The effect of this deflector has been proved on the m.s. ASHBEE, which now has been in service over a year and on which a late inspection showed all exhaust valve stems as bright as new. The exhaust valve cages are watercooled and the same design is used for the air-inlet valves, but only to make the cages interchangeable.

The fuel valve is provided with the so-called sleeve type atomizer, adjustable to suit the gravity of fuel oil used. High pressure air is used as a vehicle for the atomization and penetration of the fuel.

As in the engine of the sister-ship ASHBEE, the well known Werkspoor eccentric system of valve rockers is used on the JACKSONVILLE engine. In fact, only a few alterations have been made since the first design, and they have been carried only so far as will permit of strict interchangeability of all detail parts in present and future engines. The reversing is done very simply. All rockers are mounted with their eccentrics on a rocker shaft, which is provided with a pinion in the middle, engaging a rack which in turn is connected to the pneumatic cylinder and its oil dashpot.

The reversing resolves itself into rotating the rocker shaft through 180 degrees,




*Valve reversing mechanism*

all valve rockers—except the fuel valve rocker—going through a motion equal to tracing the surface of a cone with a large angle of vortex, and they automatically find their new position on the astern or ahead set of cams. The fuel valve rocker, being mounted on a straight eccentric, moves in a straight line athwartships an amount corresponding to the reverse angle on the cam. The illustration shows the positions clearly.

Rotation of only 90 degrees brings all rockers to a neutral position, which in other words means that no valve is open to the atmosphere and no water can therefore leak through from the silencer. This is done while the F.W.E. signal is given from the bridge or the engine is inoperative for a longer period. The exhaust gases are led through an overhead exhaust manifold and water cooled. Without any change whatsoever the manifolds can also be brought down alongside and just below the top grating, as is being done on the engines now going through the shop for the 13,000 tons oil tanker, now being built in the yards of the New York Shipbuilding Corporation.

For the operation of the camshaft the reduction drive is taken through a pair of spur gears accurately cut with a profile and wide face that reduce to a minimum the wear and consequent backlash and thus insure a more even turning of the cams. The reduced motion is transmitted from a lower four-throw-crankshaft to an upper four-throw-crankshaft through long pull-rods of the split steel-tube construction. These have a large radius of gyration in their plane of motion, and as the rods or connecting links are only subject to tension no buckling will occur under any circumstances.

The air compressor, with its attached intermediate coolers, is mounted on the forward end of the engine, and is of the conventional 3-stage type, the hp. & lp. cylinders working on the upstroke and the ip. on the down stroke. The valves are of the flat disk type, cut and ground from a special non-corrosive heat-resisting steel and closing against ground seats. No springs are fitted, in order to make them as simple and fool-proof as possible. The lp. and ip. valves are interchangeable, so only two sizes need to be carried as spares.

Maneuvering is accomplished from the lower platform at the center of the engine, where the maneuvering gear is situated close to the fuel pumps, governor, revolution counter, gage board and air compressor intake regulator.

Maneuvering takes place by means of three handles, two of which really perform the same duty and could be incorporated in one, but, by having each group of three cylinders maneuvered independently of the other group, starting air is saved. These handles are shown to the left on the draw-

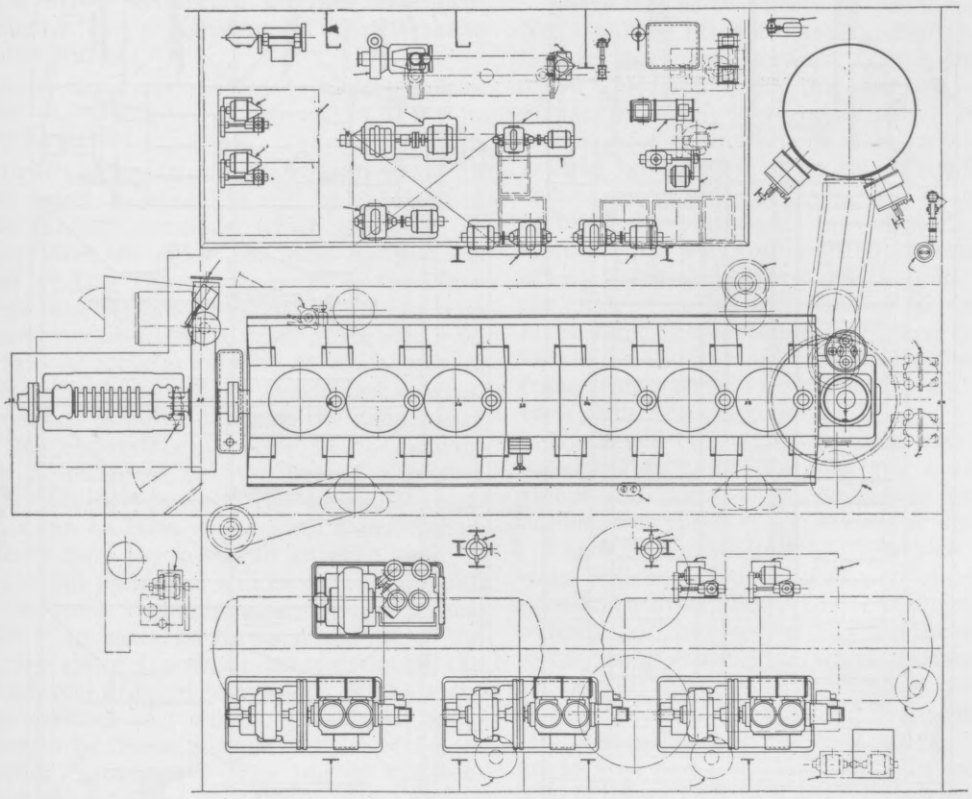
Generated on 2024-09-13 15:35 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN

ing and have three positions each, for start, stop and running, respectively. The other handle to the extreme right adjusts the engine for either ahead or astern.

The fuel pumps, of which there is one for each cylinder, are housed in a solid steel block, containing all the tappets, plungers and valves necessary for the functioning of the engine. The regulation is done by changing the opening and closing period, relative to the plunger, of the suction or measuring valve.

Each main cylinder is fitted with a four feed lubricator of the forced feed type, driven from the camshaft and timed to force the oil to the piston at or near bottom dead center. This lubricator is located, as can be seen on the drawing, on the cast housing on a level with the points at which oil is forced into the cylinder skirt, thus requiring only very short pipe lines. The lubricators are located at a convenient height above the platform or grating, facilitating inspection of pistons, cylinders and lubricators. The air compressor cylinders are also fitted with a forced feed lubricator. As a further step toward economy in lubricating oil consumption, the top and bottom rings of the piston are so profiled that they allow the oil to travel with the piston up and down the cylinder wall, minimizing oil leakage either below to the drip pan or into the combustion chamber.

Salt water is used throughout the engine for cooling. The suction side of the circulating pumps is provided with a special duplex strainer containing filtering bags, as a precaution against foreign matter, mud or silt getting into the system, especially the pistons. This might not be necessary on all motorships, but a great deal depends on the geographical routes the ship is trading in. A minor change in the piping arrangement allows a fresh water system to be adopted for the piston cooling.



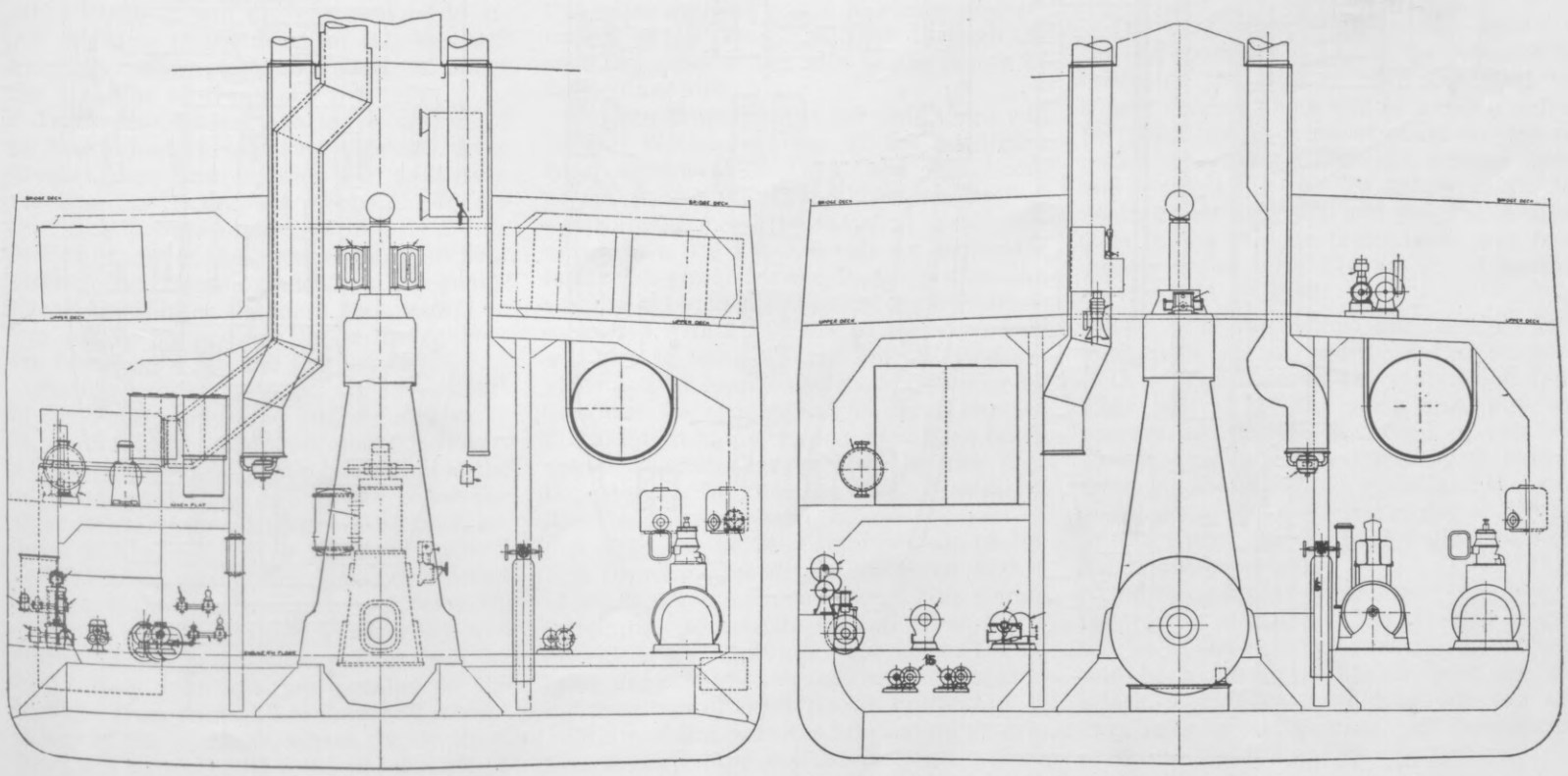
*Engine room plan of Jacksonville as a motorship*

Among the new features on the engine can be mentioned the indicator gear. The old method involving links and levers, driven off the crosshead, proved unreliable specially near the end of the strokes, due to errors introduced by the versed sine of the motion. A new indicator mechanism has been designed, based on the crank and connecting rod principle, or to be more exact, it is a duplicate of the main crank and connecting rod in reduced form. This indicator gear is driven off the camshaft through a pair of special cut spur gears rotating with engine speed, and is arranged so it can be brought in or out of action through a clutch. Further, on a six-cylinder engine mechanical pull cards can be taken with this rig exactly 120 deg. offset. The rig proved very satisfactory on the sea trial and will be duplicated on future engines.

The general layout of the engine room is a duplicate of that in the m.s. ASHBEE, (see pp. 52-57, Motorship Conversion Supplement, 1924) except that a triplex plunger pump of the Worthington make has been substituted for the rotary bilge pump.

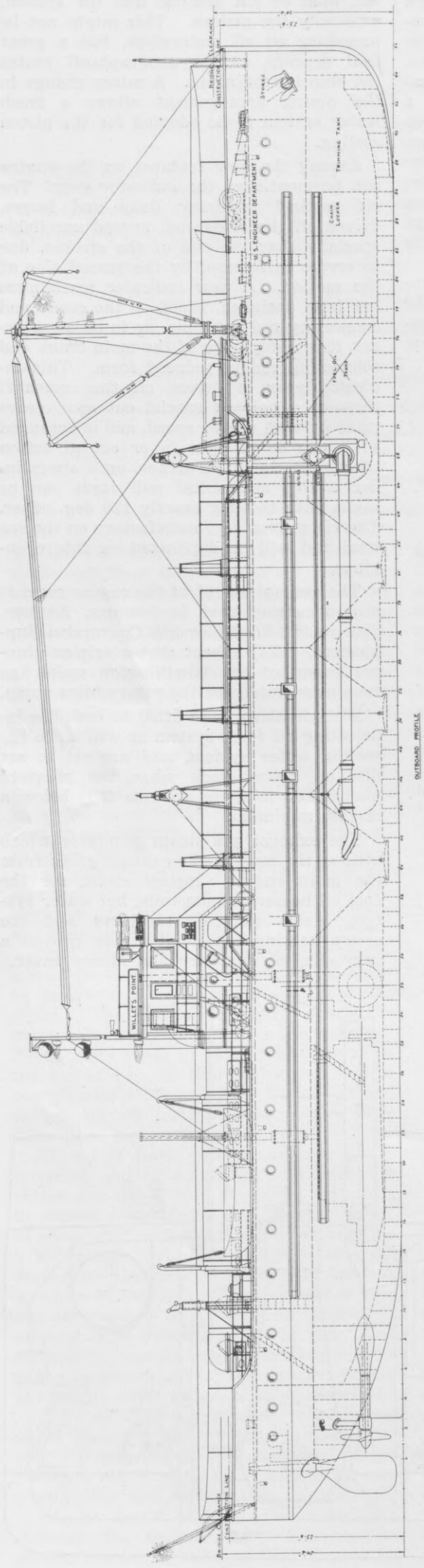
Electric alarms are fitted to both the lubricating oil force system as well as to the cooling water system, and are set to act like an alarm clock when the pressure maintained in these systems falls below a certain minimum.

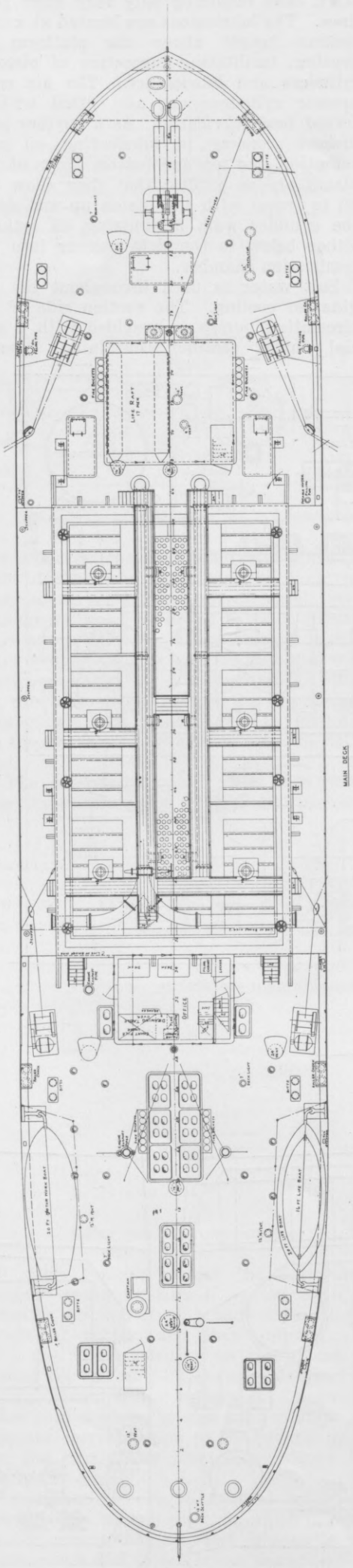
The exhaust gas steam generator which utilizes the heat of the exhaust gases from the main engine supplies steam for the fuel oil heaters, steam coils, hot water system, steam jacketed strainers and the ship's heating system. It has proven a very efficient auxiliary and money saver.

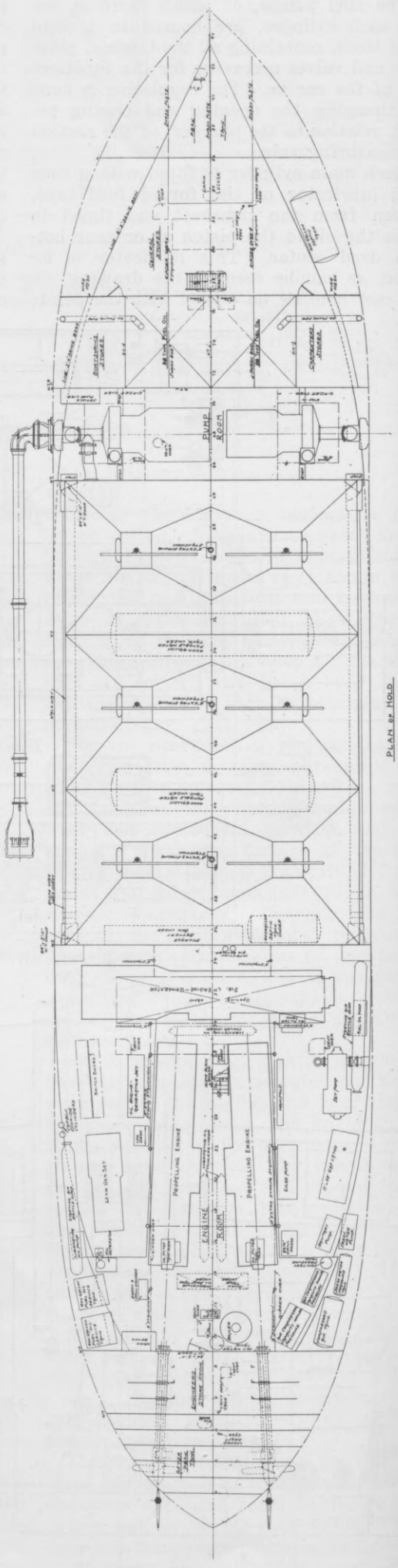


*Sections through converted engine room of the single-screw motorship Jacksonville which has just been completed*

Generated on 2024-09-13 15:33 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN




*Hopper dredge Willets Point, with direct Diesel drive, to be built by the Corps of Engineers, War Department*

Generated on 2024-09-13 15:33 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN

# Sea-Going Hopper Dredge Willets Point

## New Boat to Be Ordered by the War Department Will Have Direct-Connected Diesel Engines

IN continuation of its plans to acquire a fleet of dredges of the most modern and efficient type the War Department has called for bids on a new sea-going hopper dredge to be named the WILLETS POINT. Proposals have to be submitted before May 11th and the contract will be placed as soon thereafter as possible. This new boat will be the fifth Diesel engined hopper dredge built for the Corps of Engineers and will be slightly smaller than the 4 vessels already in service. Unlike them, however, she will have direct connected engines and propellers. The dimensions of the WILLETS POINT will be:

Length, b.p. ..... 193 ft. 0 in.
Breadth, molded ..... 41 ft. 0 in.
Depth, molded ..... 19 ft. 6 in.

Draft is an important consideration in this vessel, because she will be required to pass through canals in which the depth of water over the sill at the locks will not exceed 10 ft. The requirement is therefore made that the dredge should be able to trim to an even keel with a draft of exactly 9 ft. 6 in. A certain amount of assistance is given in this respect, by the fact that when the vessel is going through the canals part of the superstructure has to be dismantled in order to get the proper clearance under the bridges, and the dismantled sections can be installed in such a manner as to help trim the vessel to an even keel.

The flat plate keel will be 42 in. wide and 5/8 in. thick throughout the hopper space, with 1/2 in. material forward and aft of the hopper space for about three-fifths of the length and reduced to 7/16 in. at the ends. The vertical keel will be continuous from frame 5 to frame 86, and will be of 3/8 in. plating throughout. The top of the keel will be 27 in. above the base line from frame 15 to frame 86, except in way of the oil tanks where it will be increased to 36 in. Aft of frame 15 the depth of this keel will gradually be increased to 8 ft. 1 in. above the base line of frame 5.

Transverse frames are to be spaced 24 in. heel-to-heel throughout. Except in the hopper space and in the bow and stern framing, the frame bars will be 6 1/2 in. x 3 in. x 13.6 lb. bulb angles, cut to 3 in. x 3 in. section in way of the lower edge of the floor plates. The frames extend from the center line of the ship to the main deck, except in way of the water-tight lower deck where the frame bars are cut and bracketed.

Plating will be 7/16 in. for three-fifths of the length amidships and reduced to 3/8 in. at the ends. The boss plate, however, will be 1/2 in., and for the bilge-strake, the garboard strake and the strake below the sheer strake 1/2 in. plating will be used, reduced at the ends. The sheer strake will be 9/16 in. in way of the hoppers, reduced to 3/8 in. at the after end and 1/2 in. forward.

Floors will be worked transversely and spaced 24 in. heel-to-heel. They will be 27 in. deep with the top parallel to the base line from frame 15 to frame 86, except in way of the oil tanks, where the depth of floors will be increased to 36 in., and aft of frame 20 where they will be 27 in. deep to side keelson No. 1 whence they are sloped up to the ship side. Aft from frame 6 to 14 inclusive, the heights of the floors shall be increased to suit the height of the centerline vertical keel and the top of the floor run parallel with the base line. The floors will be 7/16 in. plating for three-fifths of the length and under the machinery, reduced to 3/8 in. at the ends, except that floors 30 to 34 and 66 to 70 inclusive will be 1/2 in. plating.

There will be two keelsons. Side keelson No. 1 will be fitted forward and aft of the hopper space and between frames 35 and 9 will be located to suit the outboard engine girder, of which it forms a part. It will consist of two continuous 4 in. x 3 in. x 7/16 in. angles running on top of the floors, and 3/8 in. intercostal plates will be placed between the continuous face angles. Side keelson No. 2 will also be fitted forward and aft of the hopper space, 13 ft. 6 in. from the center line between frames 65 and 71, 11 ft. from the center line between frames 71 and 78, 12 ft. 5 in. from the center line from frame 35 aft to frame 21, and then 13 ft. 9 in. from center line.

There will be four water-tight bulkheads extending to the main deck and a similar number of water-tight bulkheads extending between the keel and the lower deck.

There will be 5 hoppers, over which walkways will be fitted on port and starboard sides and athwartships. Under the hoppers a walkway will be constructed from the engine to the pump room on port and starboard.

Fuel oil bunkers are located between frames 71 and 77, extending from the top of the deep floors to the lower deck. They are located port and starboard. In each oil bunker there will be installed two sets of heating coils, with the ends of the fuel suction pipes located within the coils and arranged so that the oil will flow through the ends and sides of the coils to the mouth of the suction pipe.

For the propulsion of the ship there will be two Winton engines of the 8-cylinder type, developing 500 hp. and direct-connected to the propeller thrust shafts. A similar engine will be installed direct-connected to a 325 kw. 230 volt d.c. generator to furnish power for the dredge pumps. An auxiliary 4-cylinder Winton engine direct-connected with a 65 kw. 230 volt generator will also be used. These four Winton engines will be supplied to the shipbuilder by the War Department. The three engines of 500 hp., it is understood, have been taken out of concrete barges built by the War Department for use on the Mississippi River and now condemned.

A fifth engine set comprises an 18 hp. Hill Diesel engine direct connected with a 12 kw. 230 volt d.c. generator. This engine is required to operate on fuel of as low a gravity as 23° Beaumé. The layout for all these engines is shown on the accompanying drawings of the WILLETS POINT.

In connection with the lubricating oil system, a centrifuge will be installed. Each engine is so arranged that its base is used to collect the lubricating oil. A pump under the engine takes the oil from the base and passes it through a cooler to the oil filters. A second pump on the engine takes the oil from the filter and feeds it to the engine. From the engine bases there is a drain for the oil to a sump tank. A motor-driven lubricating oil pump is provided for drawing oil from either of the engine bases, the sump tank, both clean and dirty oil compartments and the slush tank. The lubricating oil storage tank discharges into the clean oil compartment of the sump tank.

Two day fuel tanks of 400 gal. capacity are provided in the wings of the engine room. Fuel will be supplied under an air pressure of 10 lb. per sq. in. from these tanks to the various engines.

Trolley beams of I section, sufficient to take a one-ton hoist, will be fitted between frames 17 and 32, port and starboard, over the center of the main engines and under the main deck girders for the athwartship engine at frame 32.

In the engine room there will be fitted a 17 in. x 28 in. gap engine lathe, a 22 1/2 in. drill and a combination emery and drill grinder. For the ship's service the following pumps will be used—

### List of Ship Service Pumps

| No. | Pumps | Type | Head in Ft. | Gal. Per Min. |
|---|---|---|---|---|
| 1 | Sanitary | Plunger | 100 | 55 |
| 1 | Fresh water | Plunger | 100 | 55 |
| 1 | Lubricating oil | Rotary | 100 | 60 |
| 1 | Fuel oil | Rotary | 230 | 50 |
| 1 | Service | Centrifugal | 200 | 150 |
| 1 | Boiler feed | Steam-plunger | ... | ... |
| 1 | Bilge | Plunger | 175 | 213 |
| 1 | Jet | Centrifugal | 175 | 2,000 |
| 2 | Hy'lic pressure | Hele-Shaw | 690 | 10 |

The hydraulic pressure pumps shown in the list above are to supply the pressure for operating the gear to open and close the hopper doors. There will be a motor driven refrigerating machine, of about one ton capacity, for cooling the cold storage space and for making ice. To supply steam for heating the quarters and for the heating coils in the various tanks there will be a donkey boiler with 216 sq. ft. of heating surface and oil fired.

Two dredging pumps are installed in a pumproom just forward of the hoppers. Both of these are of the centrifugal type. They will be of the same size, but will operate in different directions of rotation. The port pump will be driven by an electric motor of 400 hp. at 325 r.p.m. and the starboard pump by an electric motor of 200 hp. at 225 r.p.m. In the pumproom two 3-ton hoists are provided.

All the auxiliary machinery on deck is electrically operated. The steering engine will be of the electric hydraulic type. There will be a combined anchor windlass and winch, a capstan, two drag winches and two drag pipe winches, all electrically driven by water tight electric motors.

Generated on 2024-09-13 15:37 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN

# Shipping Board Orders 37 Auxiliary Engines

## Generator Sets to Be Installed in Converted Vessels Will Be Driven by Diesel Motors of About 100 hp.

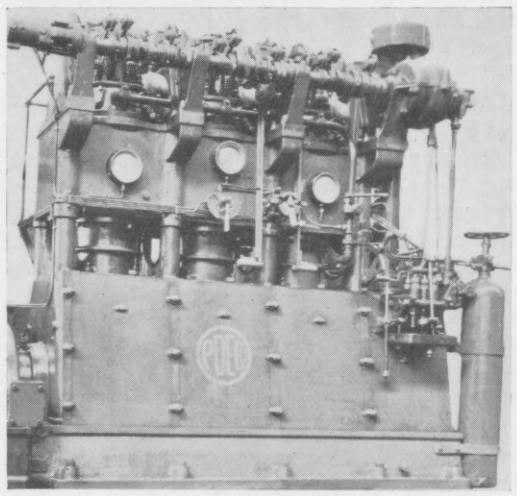
AFTER examination of the bids submitted by 14 manufacturers, the Shipping Board split the contracts for 37 auxiliary engines between three companies. The Pacific Diesel Engine Co. of Oakland, Cal., having been the lowest bidder, was awarded an order for 22 engines at a total price of $277,325; the McIntosh & Seymour Corporation got a contract for 9 engines at $144,154; and the Worthington Pump & Machinery Corporation received the order for the other 6 engines at $88,830. No separate engine prices were given out by the Shipping Board, and averages worked out from the figures above are only an approximate guide, because they include sets of spares for each vessel and not sets of spares for each engine.

It was originally expected that 54 auxiliary engines would be needed, counting three per ship. The number of vessels covered by the first section of the conversion program has been reduced from 18 to 14, and five of these will need only two of the 75 kw. auxiliary sets per ship. This makes the total of 37 auxiliary engines just ordered. The five ships that will each get only two of these auxiliaries will have a third 75 kw. generator hooked up to the independent compressor set provided for the supply of air to the main engines. Three of these ships will have the 2700 i.hp. McIntosh & Seymour single-acting engines and the other two will be equipped with the 2900 s.hp. Pacific-Werkspoor engines, none of which have attached air compressors. The big auxiliaries for these installations were included in the contracts for the main engines, the McIntosh & Seymour sets being of 400 hp. and the Pacific-Werkspoor sets about 430 hp.

All of the auxiliary engines are of about 110 hp., but the three makes differ slightly in cylinder dimensions and engine speeds. All are three cylinder engines of the 4-cycle type. The Pacific sets have cylinders 11 13/16 in. diameter and 15 5/32 in. stroke and will run at 280 r.p.m. The McIntosh & Seymour sets have cylinders 13 in. diameter and 18 in. stroke and will turn at 265 r.p.m. The Worthington engines have cylinders of 12¾ in. diameter and 16 in. stroke, and are designed to operate at 250 r.p.m.

An illustration is given of a Pacific-Werkspoor set of 110 hp. of the same general design as will be supplied to the Shipping Board, but the picture actually shows a directly reversible engine. The only real difference is in the double set of cams and in the servo-cylinder for shifting the camshaft. The pneumatically operated clutch and its connections will, of course, also be dispensed with. This engine has offset injection valves and detachable cylinder skirts to facilitate the drawing of the pistons through the lower end of the cylinders, which have been features of Werkspoor design for years. Illustrations are not available of the other two makes of engines, but they will follow the standard practice of the two firms.

A notable feature of the specification issued by the Shipping Board was the requirement that the speed of the auxiliary engines should not exceed 300 r.p.m. and preferably be no higher than 250 r.p.m. A well chosen auxiliary set for ship service has just sufficient power for the steering engine, pumps and lighting, the windlass and winches being taken care of by other auxiliary sets. Such an auxiliary engine is therefore, always well loaded. Moreover, it is called upon to operate for long periods without relief. This service is essentially different to that encountered in short coastwise runs or in harbor operation and it requires a sturdier engine. Power revolutions are preferable under such conditions.



*Pacific Werkspoor engine of* 110 *hp.*

Another clause in the specifications that has been the subject of considerable comment was the one calling for the use of air for fuel injection. The reason for this requirement seems to have been that the Shipping Board engineers considered air injection to be adaptable to changes of fuel and more likely to keep the cylinders clean under the general conditions of service to be expected on the converted ships.

Bids have been taken by the Shipping Board on the 75 kw. generators to be driven by the auxiliary engines. The total to be ordered amounts to 42, five of which are to be connected to compressor sets. The prices quoted in the bids range from $1,403 to nearly double that figure for the 265 r.p.m. generators, and are higher for the 200 r.p.m. dynamos.

During the course of the next few months bids will be asked for on the other items of machinery equipment for the converted vessels. Pump specifications will probably be the first to come out; then will follow the specifications for starting air tanks, emergency compressor sets, etc.

# Vessels for Shipping Board Conversion

FOURTEEN vessels have already been selected for the Government program of conversion from steam to Diesel power. The list includes now the WEST GRAMA, which was not given in our last issue, where only thirteen boats were named.

It is understood that the contract for the supply of four Diesel engines of 2800 s.hp. each to the Shipping Board will not be signed by the Wm. Cramp & Sons Ship & Engine Building Co. The parties have been unable to agree upon certain clauses which the legal department of the Fleet Corporation required in the contract. The number of ships comprised in the Government's first conversion group will therefore be reduced to fourteen.

There is a correction to be made in the list we published last month. The ship name given as SAIVOLSIA should apparently be SAWOKLA, although the Shipping Board's statement just issued spells this name SAWOLKA.

There is considerable diversity of opinion concerning the deadweight of these vessels. Hereunder we give a tabulation of the ships' names in the recent statement issued by the Shipping Board, together with four columns of figures showing the deadweight capacities taken, respectively, from the Shipping Board statement, the Shipping Board Register, the List of Documented Vessels issued by the Bureau of Navigation and the Record of the American Bureau:

**Deadweight of S.B. steamers chosen for conversion**

| | S. B. Statement | S. B. Register | Bur. of Nav. | Am. Bur. | Shipbuilder |
|---|---|---|---|---|---|
| YOMACHICHI | 9400 | 9500 | 9550 | 9950 | Oscar Daniels S. B. Co. |
| WILSCOX | 9400 | 9500 | 9550 | 9500 | Oscar Daniels S. B. Co. |
| TAMPA | 9400 | 9500 | 9550 | 9500 | Oscar Daniels S. B. Co. |
| SEMINOLE | 9400 | 9500 | 9550 | 9500 | Oscar Daniels S. B. Co. |
| UNICOI | 9400 | 9500 | 9550 | 9500 | Oscar Daniels S. B. Co. |
| SAWOKLA | 9400 | 9500 | 9550 | 9500 | Oscar Daniels S. B. Co. |
| CITY OF RAYVILLE | 9400 | 9500 | 9550 | 9500 | Oscar Daniels S. B. Co. |
| CITY OF DALHART | 9400 | 9500 | 9550 | 9500 | Oscar Daniels S. B. Co. |
| CROWN CITY | 8800 | 8800 | 8600 | 8800 | Los Angeles S. B. Co. |
| WEST HONAKER | 8800 | 8366 | 8600 | 8800 | Los Angeles S. B. Co. |
| WEST CUSSETA | 8800 | 8366 | 8607 | 8366 | Los Angeles S. B. Co. |
| WEST GRAMA | 8371 | 8371 | 8600 | 8550 | Los Angeles S. B. Co. |
| WEST HARTS | 8625 | 8625 | 8700 | 8800 | Columbia River S. B. Co. |
| WEST HARTLAND | 8624 | 8624 | 8700 | 8800 | Columbia River S. B. Co. |

Generated on 2024-09-13 15:34 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN

# Puget Sound Passenger Boat to Be Converted

## Kulshan a 14-Knot Boat of 926 Tons Gross, Will Be Changed from Steam to Motor Power

A FIELD in which the heavy oil engine is finding particularly suitable application is that of the small interurban passenger and freight boat. Craft of this kind, required to make regular day in and day out runs, reveal very clearly the economies in operation effected by the oil engine, and the conversions are constantly increasing all over the country.

What promises to be one of the most interesting of these installations is being made in the passenger and freight steamer KULSHAN, owned and operated by the Puget Sound Navigation Company of Seattle, Wash., and running daily between Seattle and Bellingham, a round trip of approximately 200 miles.

The KULSHAN is not the first vessel of the company's fleet to change over to oil engine power, but she is the largest conversion so far. If the results obtained from her are satisfactory, the company plans the gradual conversion of the entire fleet. The fact that it is the largest company of its kind on Puget Sound, operating a fleet of twenty-two fast passenger and freight boats to various Sound points, makes the experiment particularly significant, for other and competing companies will perforce have to follow their example in modernizing the power of their fleets.

The principal dimensions of the KULSHAN are: length 160.3 ft., beam 32 ft. and depth 20.7 ft. She is of 926 tons gross and 573 tons net, and with a 1050 i.hp. triple-expansion steam engine makes a speed of approximately 14 knots. She carries about 400 passengers, and makes a daily run of from 18 to 20 hours, covering over 200 miles. She was built in 1910.

The oil engine which is going into the KULSHAN is an 800 b. hp. Sumner of the 6-cylinder 2-cycle direct reversible open crosshead type, designed and built at Seattle, Wash. With a bore of 17½ in. and a stroke of 22 in. this set develops its rated horsepower at 210 r.p.m. The length of the engine, including thrust, is 26 ft. 3 in. and the height from center of crank, 11 ft. It weighs 45 tons.

Electric ignition is provided for warming up the engine. The current is required to be on about twenty seconds before starting the engine from cold. This current, which is not used after the engine is warm, is supplied from a storage battery, charged by a 32-volt generator attached to the engine. Starting and reversing are accomplished by means of compressed air, accompanied by oil injection. The air pressure does not exceed 200 lb.

The deck apparatus and auxiliary machinery of the KULSHAN will be the most modern, electrically driven. There will be two 30 hp. Fairbanks, Morse 18 kw. direct-connected generating sets, and the auxiliary engines will be connected through a clutch with an air compressor.

---

Four Washington-Estep oil-engines have been ordered by the Canadian Fishing Co., Ltd., Vancouver, B. C., for fishing craft.

---

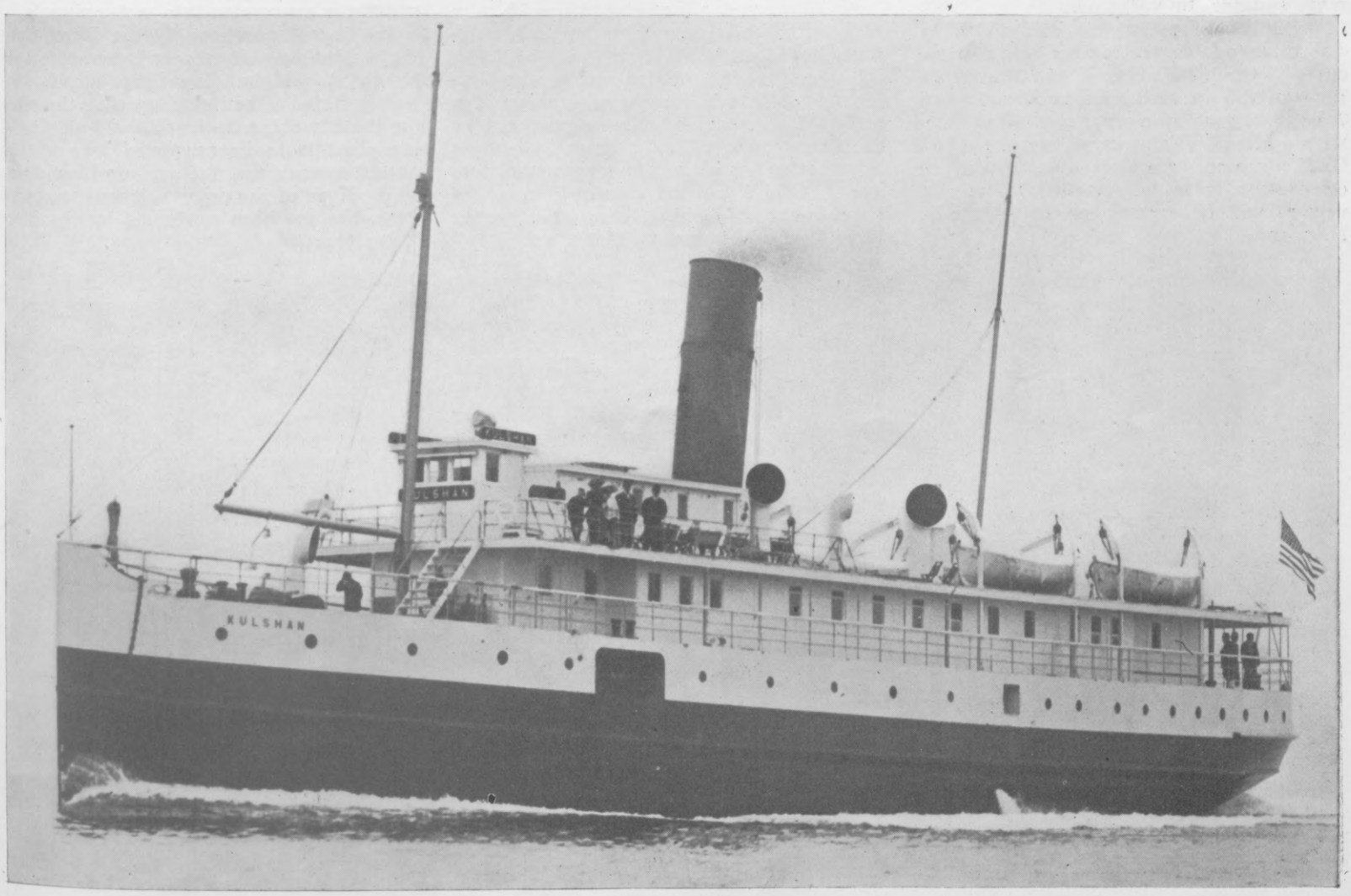
Seattle will be the American terminal port for the two new motor freighters of the Nippon Yusen Kaisha. The AZUKU MARU will leave Seattle on its first trip out of that port on May 25, and the sister ship ATAGO MARU is scheduled to sail from there on July 5. These are 12½ knot vessels of about 12,000 tons d.w. with Diesel engines developing about 4000 hp.

---

*Engineering* of London calculates that an army of 300,000 men would deflect 1,200,000 tons of American ships, if the Philippines become the theater of a serious struggle.

---

MAHOE, the 600 s.hp. tug for Young Bros. of Honolulu is scheduled to leave Seattle on May 5 for the Hawaiian Islands. She is one of the most powerful motortugs built in this country.




*Another boat of the Puget Sound Navigation Company's fleet which is to be converted to oil engine power*

Generated on 2024-09-13 15:33 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN

# Notes and News of the Month from Everywhere

## Record of New Construction, Launchings, Trials, Ships' Performances and Other Events at Home and Abroad

For the distribution of oil products along the Sacramento and San Joaquin Rivers the Union Oil Company of Cal. will shortly put into service a motor tanker with a capacity of 150,000 gallons. The dimensions of the boat will be 175 ft. length, 36 ft. beam and 7 ft. molded depth. The motor power will be provided by two Western-Enterprise engines of 165 hp.

### A Twice Converted Yacht

Another change is being made in the machinery of the motor yacht LOLOME, originally built in 1917 by George Lawley for Rodman Wanamaker. She is one of three boats of somewhat similar type which were designed specially as submarine chasers and were lent to the Government by their various owners.

Tams & King designed the vessel, which is 112 ft. 8 in. in length overall, 108 ft. in length on the water line, 16 ft. beam and 6 ft. 6 in. draft. Originally two Westinghouse turbines of 800 hp. were installed with oil burning Seabury boilers, which gave her a speed of about 20 knots.

After the war, when the Government returned the boat to Mr. Wanamaker he installed two gas engines of 150 hp., giving a speed of about 12 miles per hour. He also rearranged her below deck to make her more suitable for yacht use.

Recently the yacht was sold to S. W. Labrot, who is converting her into a Diesel craft by the installation of two Mianus engines of 125 hp. each, turning at 450 r.p.m. A 4½ kw. generator set is also being fitted with a Mianus engine direct connected to a G. E. dynamo. An electrically driven air compressor is to be installed. The conversion will be carried out at Annapolis, Maryland.

A Pacific Werkspoor engine of 100 b.hp. is to be installed in a submarine at the Portsmouth Navy Yard, for the purpose of charging batteries.

---

A new ferry boat with a 200 hp. Diesel engine is, it is reported, to be built by the Lower Columbia River Ferry Company for operation between Astoria and Megler.

---

West Vancouver, B. C., has ordered a ferry boat 107 ft. long by 18 ft. beam with a capacity for 283 passengers. The boat will be driven by a 200 hp. engine expected to give her a speed of about 11 knots.

---

The order has been placed for the oil-engined generator sets for the Gulf Refining Co.'s tanker MISKIANZA. There will be two 115 b.hp. Ingersoll-Rand oil engines and 75 kw. generators—not 75 b.hp. as given in our April issue.

---

A complete illustrated index of the U. S. S. B. ships available for conversion from steam to motor power, with a number of valuable articles on various aspects of conversion problems, can be obtained from the offices of the MOTORSHIP for $1.00 post paid. Write for the Conversion Supplement.

---

An illustrated album measuring 19 in. x 11¾ in. has been issued by the U. S. Shipping Board showing the vessels of 5000-8000 d.w.t. which are for sale by the Government. This is the second catalog of a series of four which is being prepared by the Department of Ship Sales to provide information for bidders on government tonnage. Copies can be obtained from the Department of Ship Sales, Emergency Fleet Corp., Washington, D. C.

U. S. Steel Corporation owns 35 ocean-going steamers, 80 Great Lakes steamers, 13 river steamers and 411 barges, tugs and other craft.

---

Three years ago there were no motor tug boats at Vancouver, B. C. Now there are nearly twenty oil-engined towboats.

---

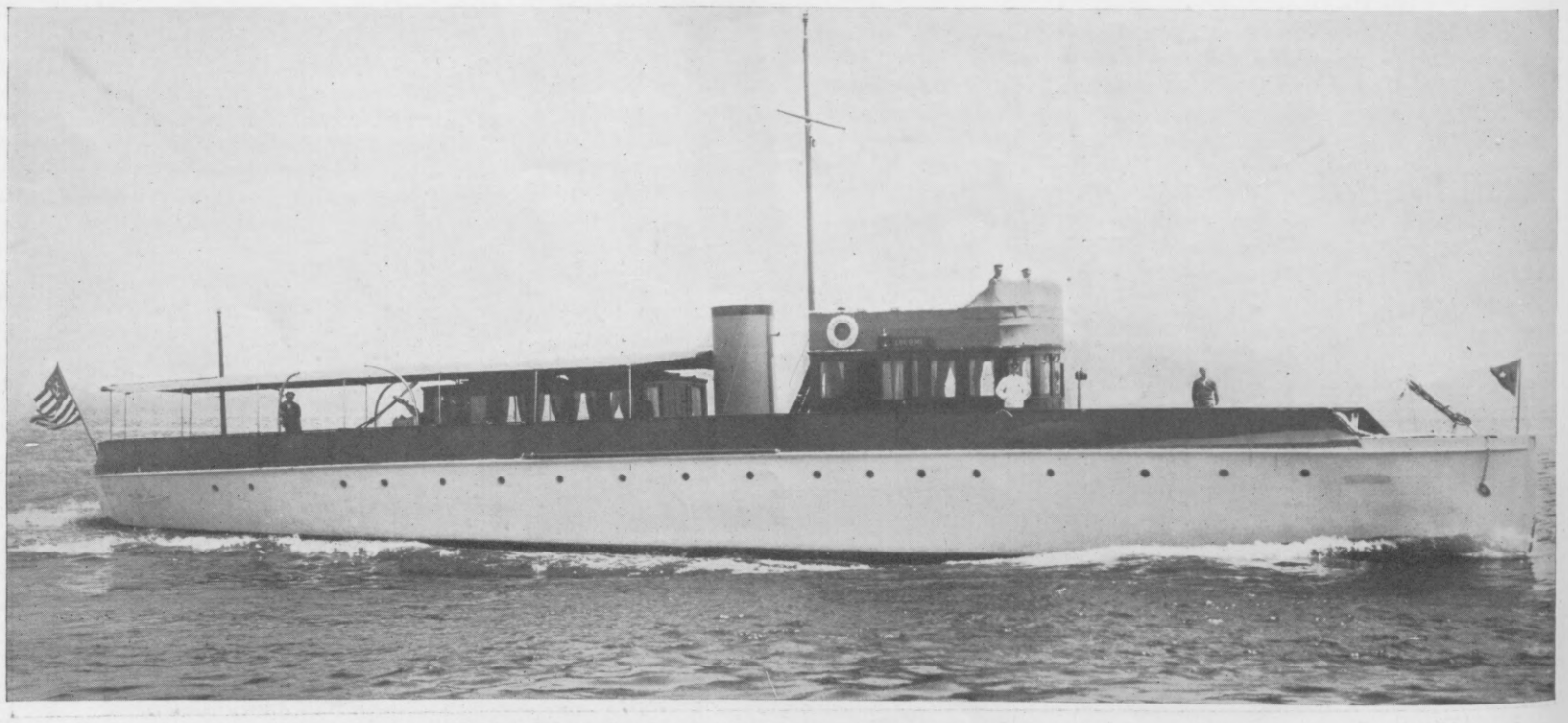
### Motorship Fleet for Ford

Henry Ford is reported to be planning the establishment of a fleet comparable in size to that of the U. S. Steel Corporation or of the Standard Oil Co. of N. J. Most of the ships, it is stated, will be equipped with Diesel engines and operated under the American flag.

At the present time the Ford Motor Company owns the two big Diesel engined ore carriers BENSON FORD and HENRY FORD II, placed in service on the Great Lakes last year. There are two steamers, the ONEIDA and ONONDAGA, under the same flag in the intercoastal trade.

A steamer of about 12,500 tons d.w. capacity, the EAST INDIAN, was recently purchased by the same company from the Shipping Board for conversion to Diesel power, and Washington reports have attributed to Mr. Ford the possible purchase of the steamships TRIUMPH and COURAGEOUS for conversion into motor vessels.

The recent purchase by the Ford Company of the property formerly owned by the Merchants Shipbuilding Corp. at Chester, Pa., is stated to be linked up with the plans for the big ocean fleet. The old shipbuilding plant is to be converted into a tidewater assembling factory and shipping base. None of the reports, it must be made clear, has yet been confirmed by the Ford Motor Company.



*Lolome, a yacht originally driven by steam and later altered to gas power, is to have oil engines*

Generated on 2024-09-13 15:42 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN

### Moosehead Lake Fleet

All of the vessels owned by the Coburn Steamship Company of Greenville Junction, Maine, that have been worth conversion are now being operated by oil engines. In 1920 the first conversion was undertaken, the MARGUERITE getting a 100 hp. engine in place of her steam power. The operating economy and general satisfaction derived by the owners from this conversion led them to install a 150 hp. engine in a larger boat, the TWILIGHT, in 1921. In the following year the KATAHDIN, 115 ft. long, 23 ft. beam and 9 ft. draft, was equipped with a 300 hp. engine. In 1923 the MOOSEHEAD was converted, her steam machinery being replaced by a 200 hp. motor which, like all the others in the fleet, was of the Fairbanks Morse type. The owners state that the first year's operation of the KATAHDIN showed a saving of $6,000 in disbursements, compared with the cost of steam operation. Additionally it is estimated that the value of the time saved through the abolition of coaling operations is worth between $1,500 and $2,000 per season. The season is comparatively short, being only 120 days. These boats are used for general freight and passenger service in the summer and at other times perform excellent work in towing logs across the lake.

*Marguerite, a converted boat on Moosehead Lake, Me.*

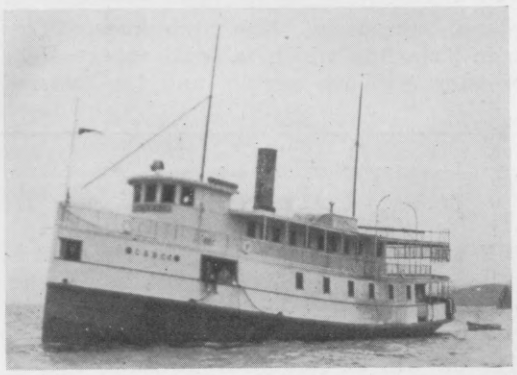
### U. S. Merchant Marine Problem

Active steps are being taken by the American Steamship Owners' Association to canvass national associations in the endeavor to formulate a truly national solution of the merchant marine problem.

The Chamber of Commerce of the United States has also taken up a survey of the problem and is planning a nation-wide conference of all interests concerned. The National Chamber is an association of all the individual Chambers of Commerce and is well entitled to be regarded as the most powerful organization of business interests in this country.

### U. S. Trade and Navigation Costs

"In the last ten years the U. S. Government spent nearly $500,000,000 on rivers and harbors. In 1924 it spent $53,000,000. In the same year for the development and maintenance of our ships we spent $30,000,000," stated T. V. O'Connor, Chairman of the U. S. Shipping Board, in his speech delivered in New York last month. Continuing his comparison of expenditures he said: "The Coast Guard maintenance insuring safety for men has cost this Government during the last ten years nearly $100,000,000. This security is shared by the ships of many nations. For the safety of navigation we are spending each year $8,000,000 upon lighthouses, and the lighthouses shine for the ships of every flag. In 1924 we spent $8,000,000 for lighthouses, $24,000,000 for Coast Guard, and $53,000,000 for rivers and harbors, or $85,000,000 in all—



*Katahdin on Moosehead Lake, Me.*

and all this for advantages accruing to ships whether owned in this country, in Germany, Great Britain, Holland, Sweden or Norway."

Hon. J. Walter Drake, Assistant Secretary of Commerce, and E. A. Filene, of Boston, Mass., will be the speakers of the evening at the Spring Banquet of the American Marine Association to be held at the Waldorf-Astoria Hotel on the evening of Thursday, May 7.

Hill Diesel Engine Company is the new title of the Bates & Edmonds Motor Company of Lansing, Mich., builder of the type of engine hitherto known under the trade name of Bull Dog, which in future will be known as the Hill Diesel.

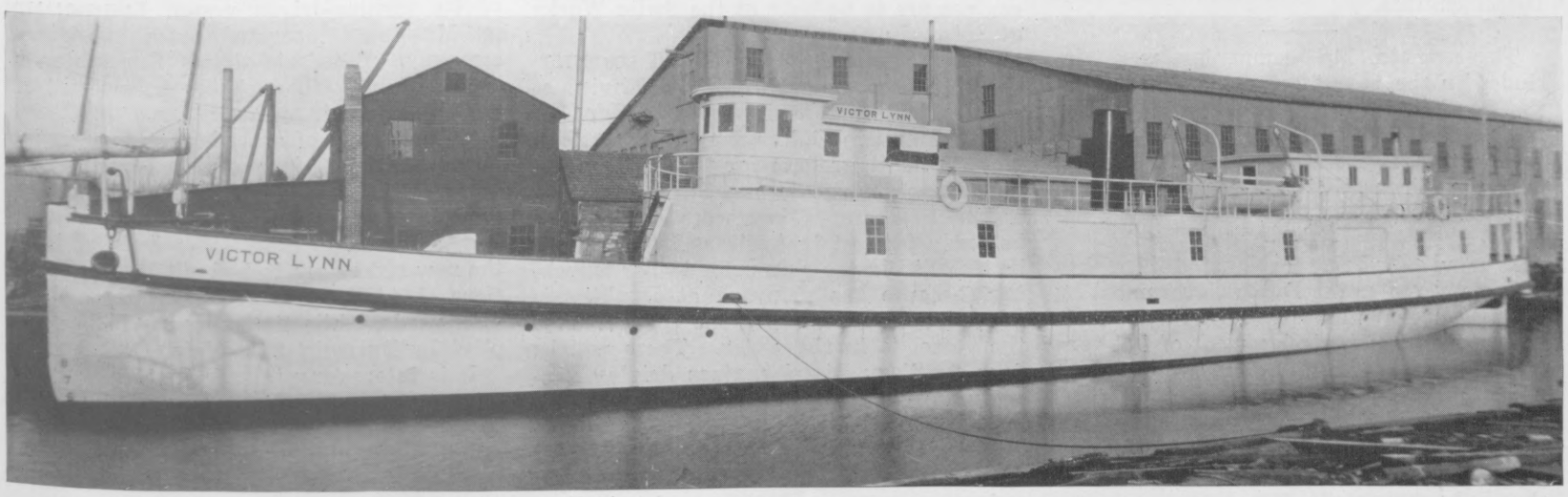
### Maryland Freighter Converted

A small freighter was recently converted from steam to Diesel power by the Smith Williams Company of Salisbury, Md. This vessel, 148 ft. long, 25 ft. beam and drawing 6 ft. 6 in. of water, is registered as 372 tons gross.

Her owner, A. A. Wootten of Salisbury, Md., operates her between Salisbury and Baltimore, a distance of 126 miles, which she makes in a 10-hour run. Sailings from Salisbury and Baltimore are scheduled on alternate nights.

An illustration of the boat VICTOR LYNN. on this page, shows that she has a large deck carrying capacity which saves the owner a considerable amount of money each year in stevedore costs. From Salisbury the shipments consist largely of canned goods and farm products, while on the return run from Baltimore the cargo generally consists of automobiles, machinery and perishables. Passengers are carried in both directions and the service is well patronized.

Equipped with two Standard oil engines of 135 s.hp. each, turning at 350 r.p.m. and swinging twin propellers of 50 in. diameter and 50 in. pitch, the VICTOR LYNN makes the night trip at a fuel cost of about $10, which is a very considerable saving over her former showing with steam.




*A converted passenger and freight boat operating between Salisbury, Md., and Baltimore, a distance of about 120 miles*

Generated on 2024-09-13 15:34 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN

LE LOING is the name chosen for the motor tanker building for the French Navy at the Le Trait yard of the Ateliers et Chantiers de la Seine Maritime and in which twin St. Nazaire-B. & W. Diesel engines will be installed.

---

Two 3570 tons single-screw motorships have been ordered by the Sté. An. de Gérance et d'Armement from the Chantiers et Ateliers de France. In each vessel a 1340 hp. St. Nazaire-B. & W. Diesel engine will be installed. A total of nine motorships are now building in France.

---

Seventy-six Diesel engines aggregating 120,000 hp. are now on order at the Stabilimento Tecnico Triestino, Trieste, which probably is a world's record.

---

Two express passenger and freight vessels of about 10,000 tons each for service between Italy and Egypt are being planned by the Lloyd Triestino.

---

The total power of the main and auxiliary engines of the two Diesel-driven passenger liners building for the Cosulich Line will be about 31,000 i.hp. Three years ago this was regarded by many experts as being beyond the wildest dreams of present-day engineering.

---

MAULY, the Italian motorship of 8700 tons d.w. which is to be driven by Fiat engines and will soon be completed, has been chartered from the Cosulich Line by the Societa Veneziana di Navigazione a Vapore. The latter company has ordered another motorship of 8000 tons from the Cantiere Navale Triestino.

---

Twenty-six large motor vessels have been built during the last few years by the Götaverken A/B in Sweden.

---

MALINI, the 1300-ton passenger motorship for the Siam Steam Navigation Co., Bangkok, has been launched at the Nakskov yard in Denmark.

---

A 7000-ton d.w. motorship with a 2000 s.hp. M. A. N. engine has been ordered by Wiel and Amundsen of Frederikshald, Sweden, from the Kockum's yard, Malmö.

---

A motorship of 6650 tons has been ordered from the Götaverken A/B by Mr. Waage of Oslo. She will be a single screw vessel with one of the firm's regular type of Diesel engines.

---

Three motorship companies were included in the recent grant of subsidies by the Swedish Government. The Nordstjernan Rederi A/B received 600,000 kroner; the Angf A/B Tirfing got 450,000 kroner; and the Transatlantic Rederi A/B was granted 300,000 kroner.

---

A new submarine designated KXII has been delivered to the Dutch Government by the Fyenoord firm of Rotterdam. This boat, which has a displacement of 821 tons on a draft of 10½ ft., is 218 ft. long with 20 ft. beam and 17 ft. 6 in. depth. Two M. A. N. type Diesel engines of 1200 s.hp. each drive the vessel at 17 knots on the surface. A sister submarine, the KXIII, will shortly be completed.

# Motorliner of 36,000 I. Hp. in Prospect

IT is reported in Genoa that the Navigazione General Italiana is about to order a motorship of 33,000 tons displacement to be driven by Diesel engines of 36,000 I.hp. This vessel, which will be named FIRENZE, will be of the same dimensions as the new steam liner ROMA now under construction for the same company. The length of the ship will be 656 ft. If the order is placed, it is stated, Ansaldo & Co. will get the contract.

Negotiations are under way between the same yard and the Transatlantica Italiana in regard to the construction of a Diesel liner of 20,000 tons which will be named PASUBIO. Though there is little doubt that this contract will be placed, there is so much uncertainty about the present financial position of the Transatlantica Italiana that the order may be considerably deferred. The Bank of Italy holds 80 per cent of the stock of the company and can be counted upon to rehabilitate it when the examination of the books, now proceeding, has been completed.

What type of Diesel engines will be employed for these motorliners cannot yet be stated. Ansaldo & Co. have a Sulzer license, but even if that yard gets the order for the ship the contract for the machinery may be placed separately. The Stabilimento Tecnico Triestino which is building the Burmeister & Wain engine, and the Officine Savoia which has a license from the M.A.N. firm, are both fighting to secure the business. Furthermore, since the settlement of the financial affairs of the Transatlantica Italiana may involve an investment of capital by the Fiat Company, there is a possibility that the engines, at least for the m.s. PASUBIO, may be ordered from the Turin Company.

---

Among the shipping companies negotiating with the Italian Government for the subsidized lines operating out of Genoa and Naples there is one in which Odero & Co. and Piaggio & Co. are associated with the Officine Savoia. In the event that this company should succeed in making a contract with the Italian Government the fleet of motorships would have M. A. N. engines.

---

The tankers METEOR building at the Ansaldo yard at Sestri Ponente, the SANGRO under construction at Naples for the Navigazione Generale Italiana, and the unnamed tank ship which the Societá Esercizio Bacini has in its yards at Riva Trigoso will all be fitted with M. A. N. engines.

---

In order to renew its fleet, by replacing steamers with motorships, the Lloyd Triestino is about to increase its capital.

# Motorship Construction in France

FOR the tankship ordered by the Standard Oil Co. (N. J.) from the Chantiers et Ateliers de la Gironde the keel has now been laid at the Bordeaux yard of these builders. The oil will be carried in 18 tanks in two lines on each side of the ship. Fourteen of these tanks will be cylindrical, fitted directly on the double bottom and extending to the upper deck, to which they are connected by an expansion box of square section. The four remaining tanks, installed two forward and two aft, will be built with bulkheads. The main engine will be of the Sulzer 2-cycle type developing 1850 hp. from four cylinders measuring 26.77 in. diameter and with a stroke of 47.24 in. For auxiliary power two Sulzer airless injection engines will be installed, one of 200 hp. and the other of 80 hp. All these engines are to be built at the Swiss Works of Sulzer Brothers.

It is expected that the THEOPHILE-GAUTIER for the Messageries Maritimes will be launched at Dunkirk in June or July. The two Sulzer 6-cylinder engines of 4380 hp. aggregate for this ship are in an advanced stage at the Paris Works of Sulzer Brothers. They were expected to be ready for test in April, and will have to be installed in the ship prior to her launching, because the shipyard at Dunkirk is not equipped for slinging the engines after the vessel is in the water. There will be four auxiliary Diesel engines driving generators, with a total power of 1300 hp. and it is worthy of note that they will be of the airless injection type.

It is confirmed that the French Navy has ordered a motor tanker from the Ateliers et Chantiers de la Seine Maritime. The dimensions of this vessel will be 385 ft. x 51 ft. x 30 ft. 6 in., and the d.w. capacity will be 6500 tons. Two Burmeister & Wain type engines developing 3500 hp. are to be built in France for this ship. The order for the machinery has been entrusted to the Penhoët Works of the Chantier et Ateliers de Saint-Nazaire.

For the Dutch motor liner P. C. HOOFT, the hull of which is on the ways at the St. Nazaire yard of the Ateliers et Chantiers de la Loire, the Sulzer engines are nearly completed at Winterthur. They are to be of the 8-cylinder type, each developing 5200 hp. The auxiliary engines for this vessel will have a total of 2000 i.hp.

It is rumored that the Messageries Maritimes is contemplating the conversion of its turbine-driven vessel, LIEUTENANT DE MESSIESSY, operated by a subsidiary company. It is said that a Burmeister & Wain engine will probably be selected if the conversion is made.

As the result of an order for two single-screw cargo vessels just placed by the Soc. An. de Gérance et d'Armement, Paris, the number of motorships building in France has increased to nine. The hulls of both the new orders are to be built by the Chantiers et Ateliers de France at their Dunkirk yards, while the engines will be supplied by Burmeister & Wain, Copenhagen.

It is interesting to note that all the vessels at present under construction by the Ateliers et Chantiers de France are motor vessels, viz., the motor liner THEOPHILE-GAUTIER and the two new motorships referred to above.

Generated on 2024-09-13 15:39 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN

### Economy of a Quebec Ferry

After last season's operation of the motor ferry JACQUES CARTIER between Caughnawaga and Lachine in the Province of Quebec, Canada, the owners made a very complimentary statement about the operating cost of the vessel. The Lachine Ferry Company is using both steam power and motors for ferry drives. The daily operating expense of the steam vessel considerably exceeded that of the motor ferry.

In fact, the owners state that on the basis of automobile carrying capacity the operating cost of the steamer was three times as much as that of the motor ferry as ascertained from the accounts for the season of 1924. The ratio in favor of the motor vessel is expected to be still more favorable during the season 1925 because of economies in the consumption of lubricating oil. At the end of last season the engines were using not much more than half the quantity of lubricating oil that was consumed when the machinery was new, and about half the reduced quantity is now being purified and used over again.

Shipowners, managers of marine departments and marine superintendents who desire to obtain the best form of engineer's logs will find the specimen logs in THE MOTORSHIP YEARBOOK a great assistance.

---

In the Ohio River pipeline dredge C. B. Harris described in the April issue of MOTORSHIP all the electrical equipment is of the type made by the General Electric Company. The name of the manufacturer was omitted by the author of the article through an oversight.

---

### Seattle's Large Ferry

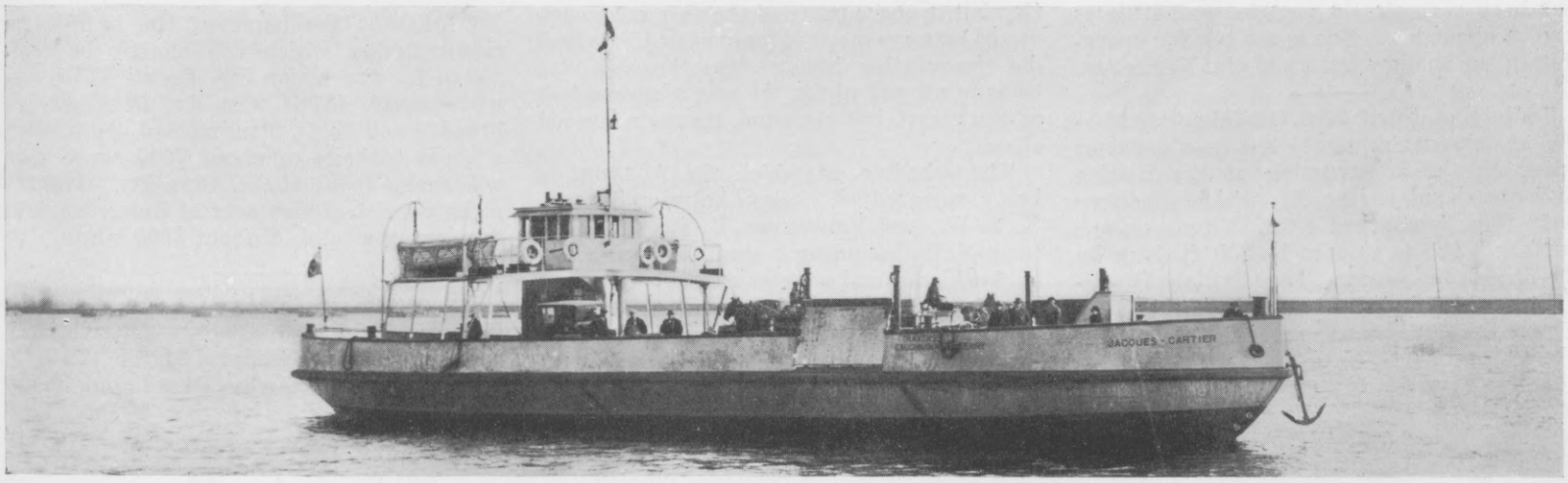
Seattle will have the largest direct driven Diesel ferry in this country when the new boat for the Crosby Marine Corporation is completed this summer. She is to be 150 ft. long with a beam of 50 ft. and a depth of 14 ft. With a 600 s.hp. Sumner engine a speed of 16 miles per hour is expected.

The boat will be able to carry a load of about 60 automobiles or trucks of average size, or 80 Fords. The appointments on board will be much more complete than

### An Oil Company's Endorsement

What the Standard Oil Co. (N. J.) thinks of motorships is very clearly expressed in an article describing the activities of the Marine Department of that company in a recent issue of *The Lamp*, which is the house magazine. We extract the following paragraphs:

"Contracts have been placed in German yards for the construction of two 15,600 and nine 12,000-ton tankers, and in a French yard for a 6,450-ton cylindrical tanker especially designed for the lubricating trade. All these vessels will be Diesel propelled, inasmuch as the internal combustion engine, in addition to saving in fuel consumption of two-thirds of that when burning oil under boilers and a slight reduction in operating personnel, has an added carrying capacity proportionate to the decreased bunker requirements, which altogether, result in saving in transportation cost per ton of cargo carried of from 20 to 25 per cent under a steam vessel. It is essential that this company should enjoy not only the lower transportation costs




*Jacques Cartier, a motorferry that has proved a great success in competition with steam ferries*

This motor ferry has been very favorably commented on by the patrons of the ferry, and all have shown preference for using it instead of the steamer. The boat is 135 ft. in length overall, 35 ft. beam and 10 ft. molded depth, driven by two Kromhout engines of 80 s.hp. each. The vessel was designed by Walter Lambert of Montreal and was fully described in MOTORSHIP of July, 1924.

---

### 1500 hp. Tugs for Mississippi

Whether the two 1500 b.hp. tow boats planned by the Inland Waterways Corp. will be built depends upon the decision of the U. S. Circuit Court of Appeals in the case of Goltra vs. Weeks et al. If the Court confirms the action of the U. S. government in seizing the Goltra fleet and those boats are returned to the jurisdiction of the Inland Waterways Corp. then the motor tow boats will not be built. If on the other hand the Court decides that the tow boats are rightfully in the possession of Mr. Goltra and that he can keep them under the terms of the contract which is revoked by the Secretary of War, then the construction of the two 1500 b.hp. tow boats will be ordered. The money is available for that purpose. The Inland Waterways Corp., it should be added, is owned by the United States under the Act of June 3, 1924.

are usually found on ferries. There will be a lunch counter with oil burning ranges and a complete refrigerating system, besides a ladies' cabin and ladies' smoking room, in addition to the usual accommodation. On account of the close proximity of one of the ferry terminals to the Alki Point Bathing Beach, where large crowds gather during summer afternoons and evenings, a dance floor measuring 30 ft. by 50 ft. will be laid in the main cabin, and an orchestra will be furnished for Saturdays, Sundays and holidays.

---

### Converted Auxiliary Yacht

One of the vessels expected to go to the starting line for the race from San Francisco to Papeete is the EVELYN MOORE, recently purchased by Harry C. Fischer. She is a schooner rigged boat designed by Henry Gielow and built by Robert Jacob in 1907, measuring 93 ft. 3 in. in length overall, 62 ft. 2 in. on the water line, with a beam of 19 ft. 6 in. and depth of 12 ft.

It was not until 1916 that she was fitted with an auxiliary engine. In that year a 45 hp. gas engine was installed in her. Her new owner has ordered a 70 hp. Mianus oil engine in place of the gas engine, and this will be connected to a 3-bladed Hyde propeller with the tailshaft operating in a Goodrich rubber cutless bearing.

resulting from Diesel propelled ships but that of foreign operation as well in order to afford as cheap transportation as its competitors in reaching foreign markets. During the year, two vessels requiring new engines have been sold to a foreign subsidiary for conversion to Diesel propulsion. Furthermore, the recently reorganized French company—in addition to operation of the new lubricating tanker mentioned, is purchasing two of our 7,500-ton steam vessels for operation under the French flag, which vessels will enjoy the recently enacted subsidy to be paid by the French government to tankers under the flag of that country.

"In order that the lower costs of Diesel propulsion may be extended to existing tankers, contracts aggregating a million dollars have just been placed for conversion of two of our 15,000-ton vessels, the E. T. BEDFORD and J. A. MOFFETT, JR. The selection of these engines as well as those for the new construction abroad is based upon a thorough investigation made by representatives of this department, who visited all the principal Diesel engine builders in Europe as well as this country, and one of each of the types considered best are to be installed in the two American vessels in order that through actual operation their relative efficiency may be determined."

Generated on 2024-09-13 15:35 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN

Thirteen out of twenty-one vessels now under construction in Harland & Wolff yards will have Diesel engines, which include ten double-acting units.

---

A knighthood has been conferred upon the managing director of Vickers Petter, Ltd., the firm which now builds the Petter type of oil engine. On his next visit to this country he will be greeted as Sir Ernest W. Petter.

---

The De Lavals Angturbin A/B of Stockholm have acquired the oil-engine building department of the Bergsunds Mekaniska Verkstads. Manufacture of this engine will be transferred to Stockholm, together with part of the Bergsunds staff.

---

A world cruise is planned for the latest British submarine XI, a big vessel with a submerged displacement of 3600 tons designed for working with the battle fleet. British reports credit her with a speed of 32 knots. This is probably due to a transposition of figures, the speed more likely being 23 knots. Information about this boat has been very closely guarded and little is known about her. She is too big for operation in the shallow waters of the North Sea.

---

To date a total of £925,710 (about $4,400,000 at current exchange) has been spent or voted on the construction of the British high-speed submarine XI, which displaces 3600 tons submerged or 2780 tons on the surface. She is said to be 350 ft. long by 29 ft. 10 in. beam. The British Diesel-driven mine-layer ADVENTURE is costing nearly the same amount.

---

John Hays Hammond, former chairman of the U. S. Coal Commission, has made public a letter he sent to the Federal Oil Conservation Board in which he stated "A fuel that will give 30 per cent efficiency in internal combustion engines ought not to be used under steam boilers where it will give only 10 per cent or 15 per cent. . . . Even the use of fuel oil at sea is likely to give way to the Diesel engine. . . . It is an economic waste to use oil as a boiler fuel in any part of the United States outside perhaps of California, Oregon and those portions of the Southwest where long freight hauls make the price of coal excessively high."

---

### Results of Supercharging

How the power of the twin 1550 i.hp. four-cycle Diesel engines of the freighter TIRADENTES was increased to 1800 i.hp. per engine by supercharging was outlined in MOTORSHIP of March, 1924. Experiences with this motorship since that time have resulted in continual improvements.

This vessel, when loaded and displacing 14,995 tons, had a designed speed of 11¼ knots with the engines turning at 125 r.p.m. and 12¼ knots on 4500 tons displacement with the engines turning at 140 r.p.m.

Supercharging gave her a speed on light draft of 12.4 knots at an engine speed of 120 r.p.m. when using her original propellers of 11 ft. 10 in. diameter and 11 ft. 6 in. pitch. New propellers were fitted of 10 ft. 10 in. diameter and 11 ft. 7 in. pitch which turned up to 135 r.p.m. on light draft and drove the TIRADENTES at 13.4 knots. The m.e.p. was reduced to 105 lb. per sq. in.

# Aorangi Works Out Well

THE 23,000 ton motor passenger liner AORANGI, owned by the Union Steamship Co. of New Zealand, completed the first round trip of her regular run in the Canadian-Australasian Royal Mail service early in April, with her quadruple Sulzer engines of 13,000 s.hp. running smoothly and a consumption of fuel and lubricating oils even more favorable than on the voyage out from England, according to the Chief Engineer, Mr. Lockhart, who says that his troubles commence when he gets into port and has to look after getting fuel supplies and necessary stores.

On the southward voyage, shortly after leaving Victoria, B. C., the AORANGI experienced violent gales with tremendous seas. One great wave is said to have swept the bridge, about 65 ft. above the ordinary water line, knocking over telegraphs and breaking instruments used in keeping the meteorological records. Besides swamping the bridge, the sea invaded the captain's cabin and some of the passengers' cabins, its visit to those parts of the ship with such vigor being somewhat unexpected. So bad did the weather become that the ship was hove to all one night. It was a severe test of the vessel, but she came through in good shape.

The schedule on which the AORANGI is being operated, of 23 days between Sydney, N. S. W., and Vancouver, B. C., via Auckland, N. Z., including a stop of about a day at Auckland, and shorter calls at Suva and Honolulu does not call for this ship to extend herself. A speed of about 17 knots is the usual, and 17½ knots is the maximum she has been driven at on this trip. At this comfortable speed for her, the AORANGI has usually been about 12 hours ahead of schedule at her various calls and has frequently had to slow down to avoid getting in before the shore people were ready for her. She is proving a popular boat, and on the northbound trip carried a record passenger list of more than 650.

The extension of electrical power to the boat winches is an interesting feature of the AORANGI'S equipment. There is a heavy chain drive between the electric motor and the winch. The boat hoists on a single part of heavy wire rope from each davit, the two wires being taken up evenly on drums. One man can hoist or lower the boat, but there is in addition hand gear on the winch for heaving the boat up by man power if necessary. The single part of the fall is a very simple arrangement compared to the ordinary fall block with many parts of manilla rope and the great length required to reach from the boat deck to the water on a liner of this size.

---

OTOKIA is the name of the twin-screw motor tanker which will shortly be completed for the Union S.S. Co. of N.Z. She will measure 437 ft. 9 in. b.p., 57 ft. molded breadth and 33 ft. 9 in. molded depth, with a gross tonnage of about 7000 tons. She will carry about 10,250 tons d.w. The engines consist of two sets of Sulzer engines developing a total of about 3000 b.hp.

---

LIMERICK was the name given to the Union S.S. Co. of N.Z.'s new Diesel-driven vessel at the launching on March 12. Two Brown-Sulzer 3000 s.hp. Diesel engines are being installed.

# Inland Waterways and Freight Rates

A REASONED business outlook on the economic value of the New York State Barge Canal appeared in a recent issue of *The Bank of America Review*. The article reflects the opinion that the reconstructed canal has not yet had a fair trial, and after citing the main hindrances to traffic development indicates that the indirect value of the canal to the people is perhaps even greater than its direct value. There is a widely accepted view that ". . . the amount of money saved by the shippers of New York State through canal competition with the railroads equals all of the money used to maintain the canal in its present condition" states the Bank review. "In the last analysis the Barge Canal must justify itself not on past history, but rather on its future capacity for serving the interests of New York State. Will its continued operation result in cheaper freight rates and more efficient transportation service? In general, traffic is being carried between Buffalo and New York over the canal at an average eastbound rate for all commodities of about 25 per cent less than goods moved between these two points by the railroads. In the case of wheat, which constitutes a large part of the canal's traffic, the saving is not so great, for a bushel of wheat can be moved over the canal at a cost of about 8c. to the shippers, as against a little over 9c. charged by the railroads. Here, however, competition has lowered the rail rates. Westbound freight which at present consists largely of fertilizer materials is carried at rates which are even more favorable to the shipper than eastbound rates. Aside from the fact that the canal offers to shippers a cheap method of transportation, the very presence of the competing system in transportation tends to force all the railroads serving the territory between the Great Lakes and the Port of New York to give cheaper rates and better service. For example, the average rate of bulky commodities carried by the railroads which parallel the Canal route are about 25 per cent lower than the average rates charged for moving these commodities over similar distances throughout the United States as a whole."

---

Ingersoll Rand engines are to be built in Belgium by the Société d'Electricité et de Mécanique, which owns the works formerly occupied by Carels at Ghent. This is the first instance on record of American designed engines being constructed in Europe, the tide having hitherto flowed the other way. Carels was one of the first builders of Diesel engines outside Germany and for many years was a leader in the industry. The International General Electric Co. is now a part owner of the business.

Generated on 2024-09-13 15:39 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN

The Pure Cane Molasses Company has placed an order with Swan, Hunter & Wigham Richardson for three motorships of 14,000 tons at prices lower than those quoted by the Deutsche Werft, Hamburg.

---

New vessels will be required by some of the Eastern lines of Furness Withy & Co., stated Sir Frederick Lewis at the recent general annual meeting of the Gulf Line. Specifications for these ships are now being prepared.

---

Two 275-ft. motorships have been ordered by the Argentine Navigation Co. (Nicolas Mihanovich & Co.) from A. & L. Inglis, Ltd., Pointhouse, Glasgow. Twin six-cylinder Harland & Wolff Diesel engines will be fitted.

---

### Six Motor Tankers Ordered

Announcement has been made by the Anglo-Saxon Oil Co. of London that they have ordered six motor tankers of about 10,000 tons d.w. These are additional to the half dozen vessels contracted for last fall. Whereas the first six vessels are building in Dutch yards, only two out of the new lot of vessels have been secured by Dutch builders. The remaining four will be built in England, two by the Palmer Company at Jarrow and two by Hawthorn, Leslie & Co. of Hebburn. The latter firm will build the engines for its two boats, whereas the North Eastern Marine Engineering Company will build the machinery for the two boats at Jarrow.

An Australian shipping company is reported to be contemplating an order for two motor vessels of about 5000 tons d.w. each, for service in Australian waters.

---

Alfred Holt & Co. of Liverpool have ordered two more large motorships for their Eastern trade. They are the owners of the DOLIUS in which the Scott-Still combination steam Diesel engines are installed, and have a second ship on order with machinery of the same kind. Their first motor vessel had Burmeister & Wain type engines, and they are returning to that style of machinery for the two new ships.

---

RUBY CASTLE, a single-screw vessel of 8000 tons d.w., recently delivered by the Caledon S. B. Co. of Dundee to J. Chambers & Co. of Liverpool is notable for her 8-cylinder Werkspoor type engine built by the North Eastern Marine Engineering Co. of Wallsend-on-Tyne. This engine has cylinders of 28.74 in. diameter and 51.18 in. stroke, and at 92 r.p.m. develops 3000 i.hp. or about 2250 s.hp.

---

THISTLEROS, a single screw ship of 4615 tons gross, has been delivered to Allan Black & Co., an English firm. This is their first motor vessel. She measures 400 ft. in length b.p., 54 ft. 8 in. extreme breadth and 35 ft. molded depth. The propelling machinery, built and installed by Harland & Wolff, is an engine of 1850 s.hp. turning at 90 r.p.m. All auxiliaries throughout the vessel are electrically driven.

The largest 4-cycle single-acting Diesel engine under construction will develop 3800 i.hp. at 105 r.p.m. and will have the high piston speed of 1033 ft. per minute. It has eight cylinders 29.13 in. bore by 59.06 in. stroke, and is building at Harland & Wolff's.

---

ALYNBANK, the tenth of the twin-screw motor vessels ordered by the Bank Line from Harland & Wolff, has been delivered to her owners and has been in New York on her maiden voyage. She measures about 5207 tons gross.

---

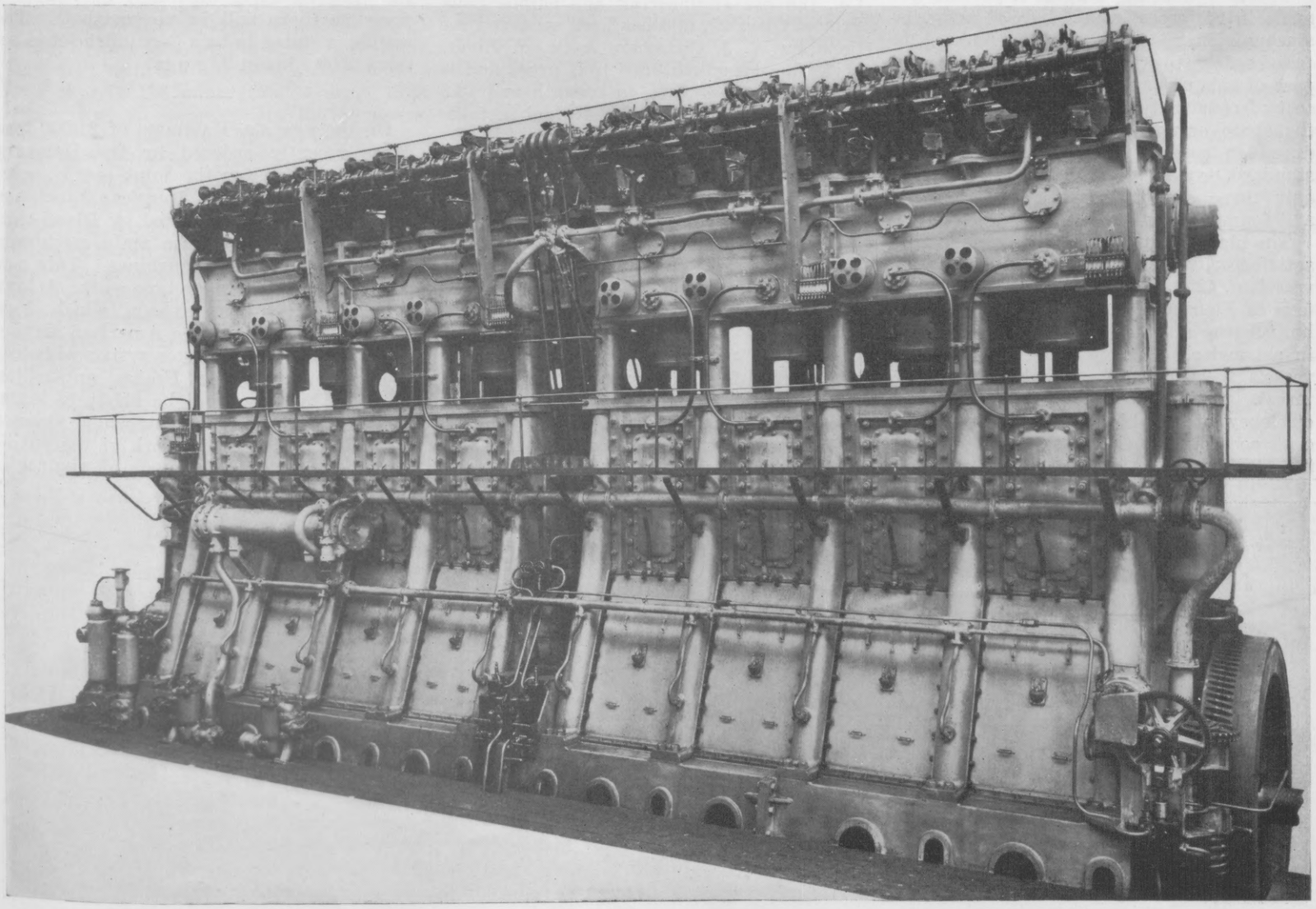
Harland & Wolff have under construction at their Belfast Works 10 double-acting Diesel engines, six of which are 10,000 b.hp. 8-cylinder units. The first of these high-powered engines has already been running under full load on the test bed with very satisfactory results.

---

DOMINION MILLER, 5089 tons gross, owned by Furness Withy & Co., London, has been renamed PACIFIC COMMERCE in line with the names PACIFIC SHIPPER and PACIFIC TRADER, two other motor vessels owned by the same company. All three are in the Pacific Coast trade.

---

A double-acting 2-cycle type of engine is being designed by Richardsons, Westgarth & Co. of Hartlepool. Some of the early patterns are now in the foundry and the development is being rushed so far as such work can be speeded up. The cylinder diameter of the engine will be about 24⅜ in.



*Eight cylinder 2250 s.hp. North Eastern Werkspoor engine for the single-screw freighter Ruby Castle, owned by Chambers & Co., Liverpool*

Generated on 2024-09-13 15:43 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN

Diesel engines as small as 5 b.hp. and stated to run as well as large ship's units are on exhibition at the annual Leipsig fair.

---

Another motorship has been delivered to W. Wilhelmsen of Oslo, Norway, by the Deutsche Werke. She is a closed shelter deck vessel 383 ft. 6 in. long, with a molded breadth of 51 ft. and a draft of 23 ft. 9 in., carrying 6300 tons d.w. There are seven water tight bulkheads, two of which are oil-tight, forming a large deep tank which may also be used as a cargo hold. Like many other Scandinavian motor vessels of this size, TOPEKA, as the new vessel is named, has accommodation for a few passengers. The machinery consists of two sets of 4-cycle Deutsche Werke engines of about 1950 s.hp. aggregate at 135 r.p.m. The engines are fitted with supercharging apparatus. All the deck machinery and the engine-room auxiliaries are electrically driven, power being furnished by two Diesel generating sets of 75 kw. each. There is a refrigerating plant and a fire extinguishing plant. The designed speed is 11½ knots.

---

### Rocking Lever Engine

Demonstrations have been given in Hamburg of a 1600 s.hp. engine of the new Mannheim 4-cycle type, first described by Dr. Mentz in MOTORSHIP of July, 1923. In this engine the crossheads are replaced by a rocking lever for each pair of adjacent cylinders. Two piston rods are connected to each rocking lever with the small end of the connecting rod between them.

The design is the biggest departure yet made in reciprocating engines of any type since piston rods were first connected to crossheads or to crankshafts. The main purpose of this unusual design is to reduce the cost of construction. Both the weight and the space occupied by the engine are reduced in comparison with an engine of standard type. A 6-cylinder engine has only three connecting rods, three cranks and four main bearings.

The big experimental engine is operating satisfactorily and is to be installed in the vessel of 4250 tons building for the Horn firm of Flensburg. Another engine of 650 hp. turning at 150 r.p.m. is to be installed in a trawler. The operation of these two vessels will be watched with unusual interest. It is stated that the mechanical efficiency of the bigger engine is 80 per cent, according to the data recorded on the test stand.

A total of 22 motorships aggregating about 125,000 tons d.w. and about 72,000 i.hp. have been built or laid down at the Deutsche Werft since 1921.

---

Another hydraulic geared motorship will soon be completed by the Vulcan Werke of Hamburg. Her two 8-cylinder Diesel engines, which develop a total of about 4100 hp., will be geared down from 215 r.p.m. to about 85 r.p.m.

---

### Geared Double-Acting Engines

One of the most interesting ship conversions now being made is that of the WULSTY CASTLE, which is lying at the Vulcan Yard in Hamburg. She is to be equipped with two double-acting engines of 850 s.hp. each, turning at 240 r.p.m. and both geared down to 85 r.p.m. on the single propeller shaft through the medium of Foettinger hydraulic gears. The engines, which will each have three cylinders, will be of the Beardmore-Tosi type constructed at the Beardmore Works in Scotland.

This combination of two of the most debated developments in the marine world today will give a line on the possibilities of reducing machinery costs by the use of high-speed double acting engines driving through a reduction gear. It is reported from Germany that the reason why this vessel has been sent to the Vulcan Yard is that the German participation in the financing of this conversion is greater than that of the British.

The vessel is owned by W. Beardmore & Co., the big engineering and shipbuilding firm of Glasgow, and has been managed for them by W. J. Chambers & Co. of Liverpool. She measures 3566 tons gross and is 356.3 ft. long, 48.7 ft. in breadth and 23.9 ft. registered depth. Her original installation was of the turbo-electric type.

---

Eight blowers for supercharging and a total of 84 scavenging blowers for 2-cycle engines have been built for various vessels by Brown Boveri & Co. of Baden, Switzerland. These are all electrically driven, with the exception of the blowers supplied to the m.s. DOLIUS, the m.s. ALTMARK, an unnamed vessel building by Armstrong Whitworth and a vessel for the Union S.S. Co. of N. Z., all of which have steam turbine sets. In the case of the DOLIUS and ALTMARK the steam is obtained by the utilization of waste heat from the main engines.

### Deutsche Werft Prices

Very quickly after British shipping circles had become excited over the contract placed by the Furness Line with the Deutsche Werft for five motorships an enigmatic situation was created by Swan Hunter's underbidding the Deutsche Werft for the vessel which the Pure Cane Molasses Company has ordered.

When the German yard took the Furness contract in competition with all the British shipbuilders it was charged in England that the German Government was subsidizing the Deutsche Werft and also that the Gutehoffnungshütte was supplying steel below market prices with assistance from the so-called Ruhr Compensation.

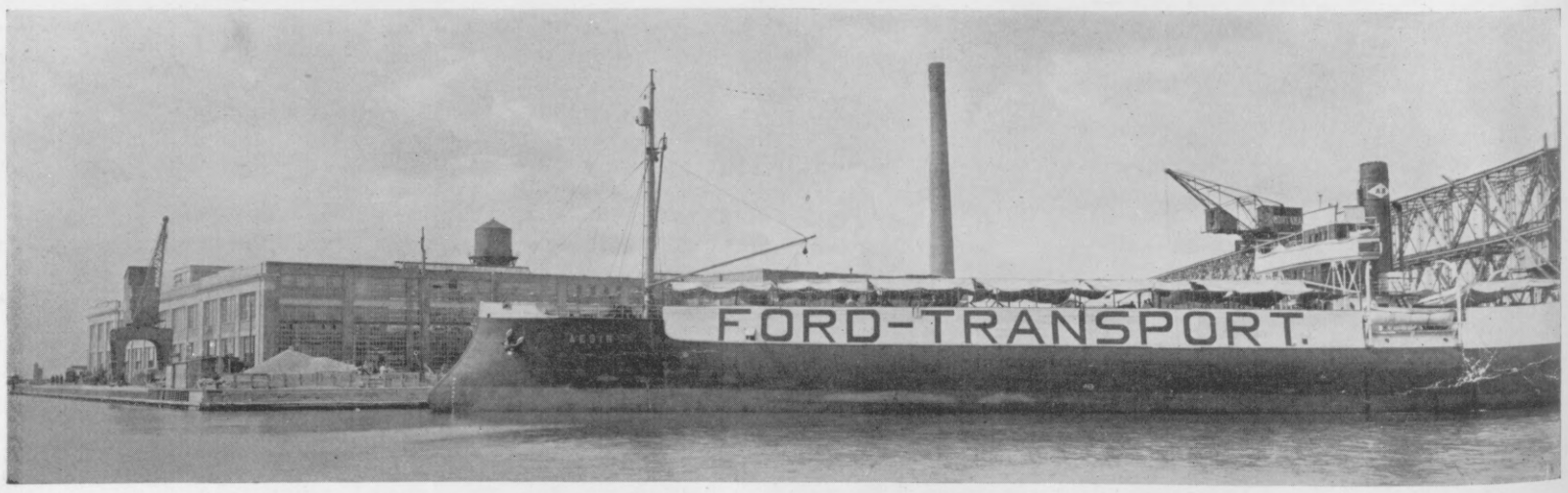
Official denial of both these reports has been issued in Germany. The Gutehoffnungshütte, which is the principal shareholder in the Deutsche Werft, is supplying the steel at the same price as it is filling other orders. The most plausible solution of the enigma seems to be that the Deutsche Werft, which is a very modern yard with very modern equipment laid out on the Hog Island system but on a smaller scale, is able to reduce its prices very considerably on certain sizes of vessels, but when quoting on ships which it has not standardized is in little better or no better position than any other shipyard.

---

Krupp's are reported to be working on a big double-acting Diesel engine employing airless injection. The engine is of the 2-cycle type with port scavenging, and with the starting valves operated by hydraulic pressure there will be no camshaft. The engine is stated to be a 3-cylinder set to develop 3600 s.hp. at 90 r.p.m.

---

On the new S.S. HAMBURG of 21,000 tons gross recently ordered by the Hamburg American Line for the joint service operated with the United American Lines, the auxiliaries will be operated by Diesel electric power, although the main machinery will consist of steam turbines. This new ship will be of the same type as the ALBERT BALLIN and DEUTSCHLAND, which have proved successful on the American service. She will have the Foerster system of bulges in combination with Frahm anti-rolling tanks. The speed will be about 16 knots. She will be the first big passenger steamer on which the exacting work of the auxiliaries will be dependent upon oil engines.




*Converted German warship Aegir, propelled by submarine type Diesel engines, advertises a cargo of Ford machines*

Generated on 2024-09-13 15:37 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN

# —Financial Reports—

### New York Shipbuilding Corporation

New York Shipbuilding Corp.'s earnings for the year ended Dec. 31, 1924, showed an improvement over the previous year. The net income for the last year was $131,331 after charges, but before Federal taxes. This compares with $90,362 after Federal taxes in 1923. The income account for 1924 compares with the previous year as follows:

| | 1924 | 1923 |
|---|---|---|
| Op. loss | $292,488 | ‡$795,919 |
| Other inc. | 901,548 | 277,469 |
| Total inc. | $609,060 | $1,073,388 |
| Prov. for cls | 400,000 | 700,000 |
| Misc. chgs | 77,729 | 281,348 |
| Fed. taxes | ..... | 1,678 |
| Net inc. | $131,331 | $ 90,362 |
| Divs. paid | 400,000 | 200,000 |
| Deficit | $268,669 | $ 109,638 |
| Prev. surp. | 5,967,867 | 6,077,505 |
| Adj. of taxes 1918 | §68,191 | ..... |
| P. & L. sur | †$5,631,007 | $5,967,867 |

†Does not include adjustments consequent upon Federal tax refunds allowed by revenue agent's audit for years 1918 to 1921 inclusive, subject to confirmation by Treasury Department. ‡Income. §Debit.

### Submarine Boat Corporation

Submarine Boat Corp.'s earnings for 1924 were $160,810 compared with $234,232 in 1923. The year's profits from operations, however, were $120,296 compared with a loss of $203,776 under this head in 1923. There was an improvement in the operation of the fleet, but it was offset by a relative decline in other income, the 1923 total having been swelled by the settlement of a claim against foreign business.

Development of the Port Newark Terminal is steady and regarded as encouraging. Barge operation on the New York State Barge Canal showed an improvement over the preceding year in tonnage and net earnings.

At the Groton Works of the New London Ship & Engine Company, it is stated, work has practically been finished on the S-type submarine for the U. S. Navy and there are two submarines in hand for Peru. The number of Diesel engine orders received has not been sufficient to maintain this big plant in full capacity operation, but the belief is expressed that all the facilities of the plant will soon be absorbed by the new business expected.

The Elco Boat Works at Bayonne had a successful year and since Jan. 1 of this year has received orders equal to the entire sales for 1924. A wage claim which the Submarine Boat Corp. has against the Navy Department is expected to be settled under the next naval appropriation bill. The amount is understood to be nearly $4,000,000, and its payment will help the company considerably.

### East Asiatic Co. of Copenhagen

In the report of the Danish East Asiatic Company for 1924 it is shown that the net earnings amounted to 9,156,344 kr. The capital of the company is 50,000,000 kr., and as the reserves total 62,500,000 kr., nearly all the net earnings are available for distribution to the stockholders. The dividend to be paid for 1924 is 15 per cent. Shipping operations are one of the most important branches of the company's business. The book value of the fleet comprising 21 ocean-going motorships of 166,820 tons d.w. of an average age of about seven years is 27,621,984 kr.

### Blohm & Voss A/G, Hamburg

The premier shipbuilding company of Germany recently issued a report with a gold mark balance sheet showing its position on July 21, 1924. It is stated that the company had been very hard hit not only by the ban on warship construction, but also by the lack of orders for any vessels of large size, for both of which classes of craft the yard had been specially developed. The productive capacity is 120,000 tons, but owing to the improbability of any orders being placed for big vessels, it is stated that the capacity of the yard should be reckoned as not more than 60,000 gross tons. Even this was not filled last year, when only 36,000 gross tons were delivered. It is not expected that 1925 will show any improvement.

### Harland & Wolff, Ltd., Belfast

In the report of Harland & Wolff, Ltd., for the year ended Dec. 31, 1924, it is stated that the dividend on the prefered stock has been paid and also 5 per cent on the common. It is not made clear what the earnings were, but apparently the net fell short of dividend requirements by about $95,000 and necessitated a transfer from the reserve fund which now stands at about $6,000,000 The outstanding stock is nearly $50,000,000.

Last year a total tonnage of more than 105,000 gross tons was launched, which is slightly more than in the previous year. Of the thirteen vessels completed eight were fitted with Diesel engines, having a total of 42,000 i.hp. At present the company has under construction twenty-one vessels of which thirteen are motorships. The total number of main Diesel engines on order is thirty-five.

The report makes the remark that: "Motorships, being more economical to run than steamers, have made remarkable progress, and although their first cost is at present retarding somewhat their more general adoption, it seems probable that within a comparatively few years (unless some way should be found of greatly increasing the efficiency of steamships) the motorship will supersede the steamship, in much the same way as in the course of the last century the steamship superseded the sailing ship."

### Swan, Hunter & Wigham Richardson, Ltd.

During the year ended Dec. 31, 1924, Swan, Hunter & Wigham Richardson, Ltd., had net earnings of about $1,600,000, permitting them to pay 8 per cent on the common stock and the regular dividend on the preferred stock. The combined tonnage launched by the company's associated yards in 1924 amounted to about 190,000 gross tons. Seven of the vessels were motorships. Three of the company's shipyards were closed down last year on account of lack of work, and the yards which have been kept open are now moderately supplied with work.

### Vickers, Limited

A balance of about $1,900,000, after adjustment of reserves, is shown in the profit and loss account of this company for the year ended Dec. 31, 1924. This compares with $2,375,000 for 1923. No dividend was paid on the common stock. The report did not hold out any hopes for an improvement in the lines of activity the company and its subsidiaries are engaged in. The outstanding common and preferred stock of Vickers amounts to about $98,000,000 and the bonds to about $16,000,000.

# World's Motorship Construction

A MARKED continuation of the growth in motorship building is recorded in the returns just issued by Lloyd's Register of Shipping for the quarter year ended March 31 last.

Motorships have reached a new peak of 42 per cent of the world's total shipbuilding, whereas they amounted to only 37 per cent at the end of last year and had only grown to 28 per cent at this time last year. The growth is even more noteworthy when considered without the British shipbuilding figures.

In the maritime countries other than Great Britain motorships represent 54 per cent of the present shipbuilding work in hand, which is an advance over the figure of just about 50 per cent at the end of last year and compares with 35 per cent at the end of March, 1924.

Great Britain and Ireland do not make such a good showing, the total of motor vessels having increased to 30 per cent as contrasted with 22 per cent at this time last year. The figures for Great Britain and Ireland are given immediately hereunder:

| | Mar. 31, 1925 | Dec. 31, 1924 |
|---|---|---|
| Motor | 359,920 | 320,137 |
| Other types | 805,548 | 853,328 |
| Total | 1,165,468 | 1,173,465 |

The shipbuilding position in the other maritime countries shows up very clearly when considered in the bulk. In the tables given below it will be seen that the figures in the top line are bigger than those in the lower line, meaning that there is more motor tonnage under construction there than steamers and sailing ships combined. This shows the trend of conviction throughout the world:

| | Mar. 31, 1925 | Dec. 31, 1924 |
|---|---|---|
| Motor | 661,711 | 603,601 |
| Other types | 569,731 | 693,370 |
| Total | 1,231,442 | 1,296,971 |

There is a slight decrease in the total shipbuilding throughout the world. On March 31, 1925, there were 2,396,910 gross tons under construction compared with 2,470,436 gross tons at the end of last year.

Generated on 2024-09-13 15:40 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN

# MOTORSHIP

*Trade Mark Registered*
Founded 1916


Contents copyright, 1925, by MOTORSHIP


Published monthly at 27 Pearl Street, New York

Thos. Orchard Lisle.....Editor
Russell Palmer.....Manager

Offices of MOTORSHIP

NEW YORK.....27 Pearl Street
*Editorial, Advertising and Subscriptions*
*Cable address*—Motorship, New York
*Telephone:* Bowling Green 3420

SAN FRANCISCO.....417 Montgomery Street
*Telephone:* Douglas 6974

SEATTLE.....71 Columbia Street
*Telephone:* Elliott 4715

ANNUAL SUBSCRIPTION RATES

Domestic .....$3.00
Mexico ..... 3.00
Canada ..... 3.50
Other countries (Postal Union)..... 3.50

Single copies: United States, 25 cents; other countries, 35 cents

MOTORSHIP is published on the 20th of the month prior to the title month of issue, and all changes and any copy for advertising must be received by the publisher not later than the 5th of the month, if proofs of the copy are desired. Notice of discontinuance of advertising must be given 30 days in advance of publication of the magazine.

Readers are invited by the Editor to submit articles, photographs or drawings relating to motorships, marine oil-engines or auxiliaries. Contributions used in the magazine are paid for on the 15th of the title month of issue, and other contributions are returned as promptly as possible.


## Motorship Construction Figures Are Still Advancing

EVERY time the periodical returns of the world's shipbuilding are issued the motorship position shows up more and more strongly. According to the latest records, published on another page in this issue, motor vessel tonnage under construction in countries other than the United Kingdom exceeds the combined steamer and sailing ship tonnages. This is the first time the motor vessel has assumed the leading position. Based upon the total figures for the whole world, that is to say, including the United Kingdom, the combined steamer and sailing vessel tonnages are still slightly ahead of the motorship tonnage.

The aggregate motor tonnage now under construction in all countries amounts to over 1,000,000 tons. This is equal to the total motor tonnage built in all of the thirteen years between 1908 and 1920 inclusive and is substantially equal to the total motorship tonnage built during the last three years. Such a rapid increase in the rate of growth of a new type of vessel has never been paralleled, even in the days when steam first began to supplant sails. Many years will pass even at this rapid rate of motorship construction before the total motor tonnage in service throughout the world equals the steam and sailing tonnage. It would be undesirable for the motorship to supplant the older fashioned types of vessels at too great a rate. So long as motorship construction represents the larger part of the new work in the shipyards there will be assurance of good business for those who make the engines and those who build the ships. If anything like a motorship boom were to occur, the shipyards of the world would be filled for a time, but there would be an inevitable reaction. In its bearing upon conditions in the shipping world, the addition of too great a motor tonnage each year would not only disturb ship values in an almost destructive way, but it would also introduce special complications by reason of the fact that the new generation of motorship engineers cannot be brought up with sufficient rapidity. The total cessation of steamship construction would not be welcome. Far preferable is it for the motorship to assume its proper position in the world without fundamentally upsetting shipping conditions.

## Steam Adherents Are Being Driven to the Defensive

WHEN this magazine was founded, about nine years ago one of the chief features of its policy was an aggressive campaign to educate ship operators in the economy and efficiency of the marine oil engine for marine propulsion. One of the most forceful methods of bringing out the advantages of the motorship was found to be the direct comparison of motor vessels and steamers of about the same size. There were many people in the shipping world ready to listen, but most of them remained dubious during the early years.

How great a change has come over shipping opinions is now strikingly evidenced by the defensive tone of many of the technical papers presented to various institutions throughout the world by the various adherents of steam power. There is practically no paper read before any of the technical societies in which reference to Diesel engines or motorships is omitted. The modern type of marine propelling engine has indeed become part and parcel of every consideration involving marine machinery.

A very interesting example of this tendency was seen in one of the principal papers read at the meeting of the Institution of Naval Architects last month in London. The author of this paper is a veteran naval architect whose name is pretty well known throughout the world. His introduction was an acceptance of the present favor shown toward the oil engine, while the rest of the paper consisted of arguments based upon a proposed steam system which has not yet been tried out, but is calculated to be superior to the oil engine at least in big powers and in high speed passenger vessels. Almost up to last year this paper would have been presented without any reference at all to the motorship or marine oil engine.

In the United States we have not yet advanced to the same position, but we are getting there rapidly. Quite recently David Kennedy, one of the foremost writers on shipping topics in this country, published a review of the progress of the motorship and in his concluding remarks warned the steam people that now is the time for them to get busy and show what they have to offer in comparison with the motor vessel.

## An Analysis of the Mechanics of the D. A. Engine

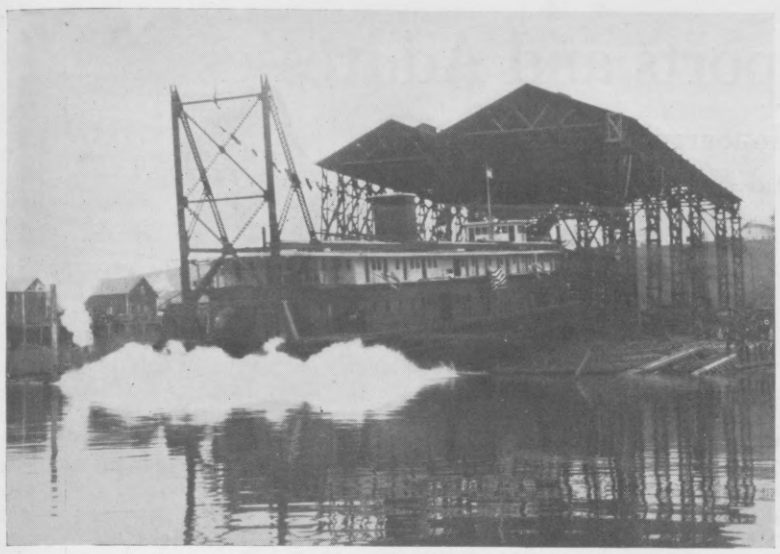
IN this issue is published the concluding section of the paper which Dr. C. E. Lucke read before the American Society of Mechanical Engineers last fall. It was deemed worthy of reprint in full in our columns because it is the first complete analysis of the mechanics of the double-acting type of oil engine presented anywhere in the world. The assembly of such a variety of data in a single paper has seldom been witnessed. Most of the more notable engines that have been built for marine service were drawn upon to provide the basis for the establishment of the figures which Dr. Lucke set up to show the magnitude of the physical problems in the different types of engines. If such a paper had been presented to one of the European societies there is no doubt that it would have been given more attention by other technical magazines in this country. Because it represented an American contribution to the oil engine art it was apparently not accepted by technical editors as a sufficiently worthy and important addition to oil engine bibliography. It was unfortunate that the paper did not gain wider acceptance, because not only is it a very original contribution, but it also demonstrates that the time has arrived when engineers in this country are beginning to add their quota to the really valuable analyses of oil engine problems.

## Future of D.-A. Engines

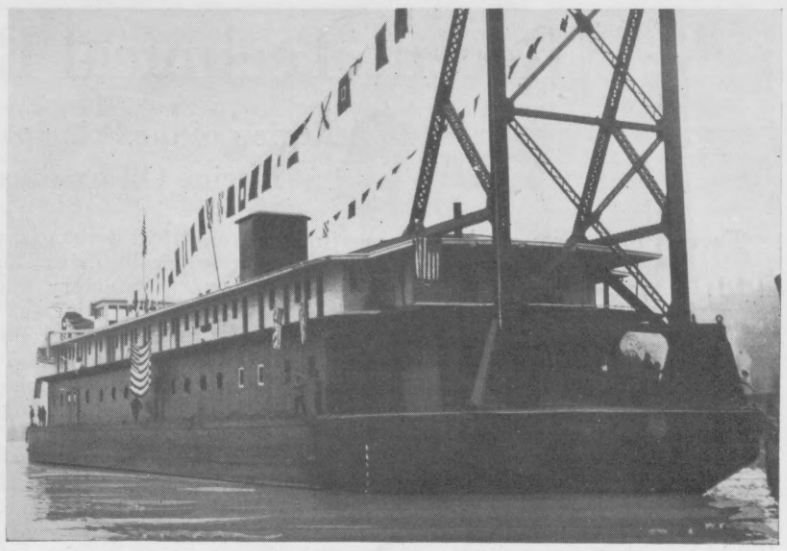
FOLLOWING right upon the publication of the pictures of the double-acting engines built in Copenhagen the release of the illustrations of still larger double-acting engines built in the United Kingdom will help to prevent the importance of this newly developed type of engine from being forgotten. There are a number of orders on hand abroad for engines of this style in powers up to 10,000 hp. per unit. They are all for large passenger liners, needing big power and which up to the present had perforce to be built with steam machinery. A very great change is undoubtedly pending in this class of ship. It is said even that one of the companies on the other side is studying at this time the plans for a 40,000 hp. motor liner. Perhaps even we shall have to adjust our ideas about the supremacy of steam in the biggest of the Atlantic liners, for the day may yet come when some of those big vessels will be unable to stand the burden of the cost of oil burnt under the boilers and will be converted from steam to oil engine power. While, however, the double-acting engine will make an almost unchallengable development in the region of larger and higher powers, it must in the course of time begin to make a bid for adoption in the range of powers at present belonging to the single-acting type of engine. Such progress can only take place slowly, and years will pass before any definite progress can be registered in this direction. There is always room for variety in the designs of machinery. One has only to consider how far steam machinery is from a standard design even today after approximately a century and a half of development.

One need not expect, therefore, that the double-acting engine will make every other type or design of oil engine look out of date. In fact, although many owners of vessels and boats have for years looked forward to the advent of the double-acting oil engine, few of them would have the courage to place an order for this type of engine right now. They would sooner get alone with a single-acting engine and let somebody else show what engineers can do with the double-acting design.

Generated on 2024-09-13 15:36 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN



*Launching of the big dredge Clackamas*



*Clackamas afloat in a light condition*

# Largest Pipeline Dredge Nears Completion

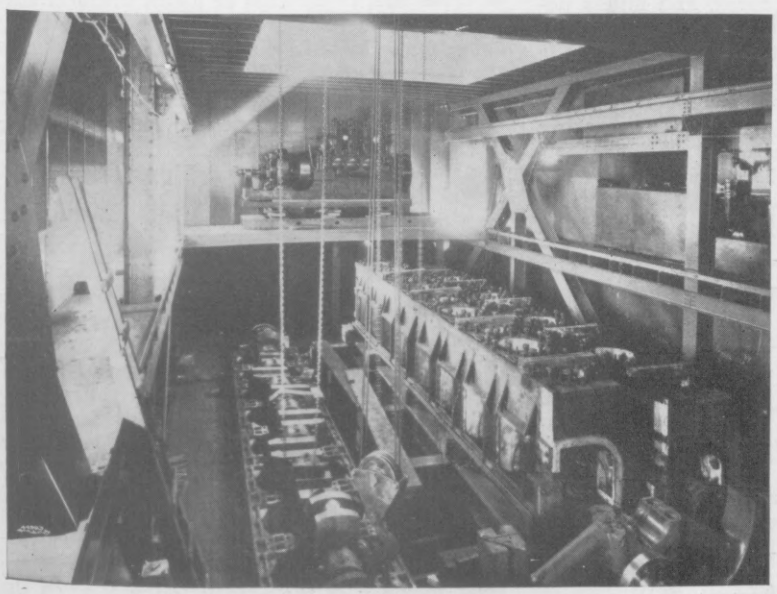
## Good Progress Is Being Made in Port of Portland's New Diesel Engined Vessel Clackamas

WITHIN a couple of months the CLACKAMAS, which will be the most powerful pipeline dredge in the world, is expected to be in operation in the West Swan Island Channel of Portland, deepening the fairway and assisting in the reclamation of land. This dredge, which was first fully described in MOTORSHIP of June, 1924, will use a 30 in. pipeline through which the dredgings will be forced by a centrifugal pump direct connected to a 500 volt d.c. 2700 hp. Westinghouse electric motor having a speed range from 250 r.p.m. to 360 r.p.m. This is the largest motor of its kind ever built for connection to a centrifugal pump and weighs 40 tons. Power for the dredge pump motor, auxiliaries and electrical conveniences for the crew of fifty men will be generated by two 900 b. hp. and two 800 b. hp. McIntosh & Seymour engines, direct connected to 500 volt Westinghouse generators turning at 150 r.p.m.

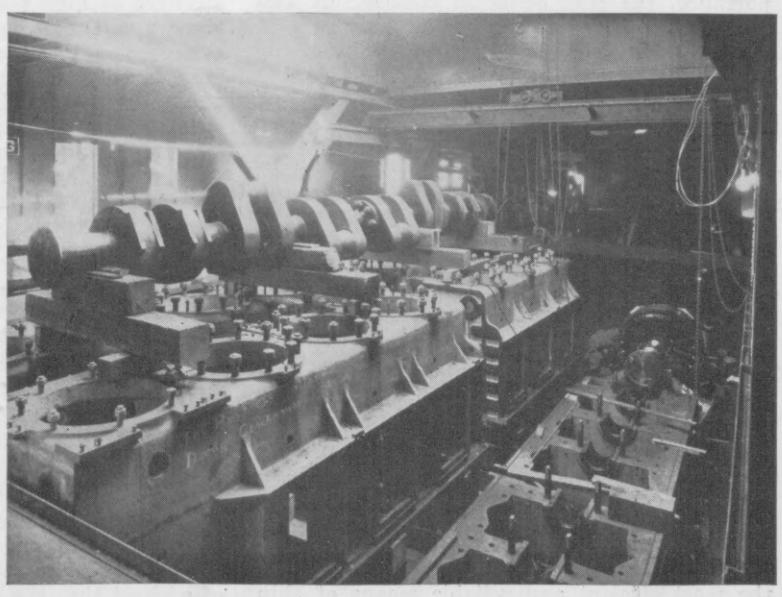
An interesting feature of the installation will be the use of the Ward-Leonard system of control for the 250 hp. cutter motor and 75 hp. swinging motor. Power for these drives will be furnished by a 5-unit motor generator set operated from the main 500 volt generator bus. Two of these five units will be 250 hp. motors for driving the set, and to furnish a neutral point for a 500/250 volt 3-wire system the armatures of these two motors are wound for 250 volts and connected in series across the 500 volt bus. The remaining three units of this set will be a 200 kw. cutter generator, a 60 kw. swing generator and a 60 kw. auxiliary generator. There will be also a motor operated hoist for the dredge ladder forward and another hoist located near the stern for lifting the spuds. All control equipment on the dredge will be of the remote control type with complete manipulation from the pilot house.

The hull of the CLACKAMAS was built by the Wallace Equipment Co. of Seattle, and the ship is being fitted out at the Peninsula Shipbuilding Plant at Portland. The two pictures on this page showing the launching and showing her afloat convey a good idea of her big size.

Two views are also given of erection work in progress in the engine room. One picture shows the frame of the port engine lifted off the bedplate and set on blocks to permit the bedplate to be located and the bearings lined up. The crankshaft is shown on top of the frame. In the other picture the frame of the starboard engine has been taken off the bedplate and set over beyond the port engine while the crankshaft was being lined up. In the foreground one can see the wire rope and hook of the 10-ton overhead crane which is proving a great convenience in installation. In addition to this crane the CLACKAMAS will be equipped with two 5-ton cranes running on trackage the full length of the engine room. In the same picture appears the 110 hp. Atlas Imperial auxiliary engine installed on a flat, while on the port side is the group of tanks used in the centrifuging system for the fuel oil described in the April issue of MOTORSHIP.



*Bedding the crankshaft of the starboard engine*



*Lining up the bedplate of the port engine*

Generated on 2024-09-13 15:33 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN

# Recent Technical Reports and Addresses

## A Review of the Principal Monographs on Motorships, Marine Oil Engines and Kindred Subjects

### Factors in Design of Fuel Measuring Pumps for Diesel Engines

*By Lieut. J. E. Canoose, U. S. Navy. Published in the Journal of the American Society of Naval Engineers, Washington, D. C.*

This contribution to the bibliography on fuel pumps is a supplement to a paper published by the same author in the Journal last fall. Lieutenant Canoose is stationed at the Brooklyn Navy Yard and his investigations and studies of pump problems have been confined to three types of submarine engines. He deals with the magnitude and duration of the vacuum during pump suction, the supercharging of the pump feed, pressures acting on the suction valve operating gear before the suction valve is seated, the blow-down effect in discharge valves, the influence of fuel charge residues on governor action, and the effect of design on irregularities of operation due to tappet clearance variations. The paper concludes with a review of the practical application of the points brought out by these studies.

### Electric Propulsion of Ships

*By H. Franklin Harvey, Jr., and W. E. Thau. Published by the American Institute of Electrical Engineers, New York.*

The electric propulsion of practically all classes of vessels is covered in this paper. The different types of electric drive are treated in general, and special attention is given to Diesel electric drive for the reason that this type of electric drive is believed to be of more general interest, especially to the inland section of this country. It is especially applicable to the smaller sized vessels used on rivers and lakes, as well as to vessels in the coastwise trade and to sea-going vessels.

Mr. Harvey is the electrical engineer of the Newport News Shipbuilding & Dry Dock Co. and Mr. Thau is on the marine engineering staff of the Westinghouse Electric & Manufacturing Co. They cover the subject very thoroughly. The part of the paper dealing with Diesel electric propulsion affords practically a complete record of the developments in this type of propulsion. The table of vessels so fitted lists 34 boats built in this country since 1920. It is difficult to make extracts from the paper that adequately convey its importance, the text being so concise. A full copy of the paper should be in the hands of all interested in Diesel electric propulsion.

### The Electrical Engineer in the Merchant Marine

*By G. A. Pierce. Published by the American Institute of Electrical Engineers, New York.*

It is an anomaly that the electrical engineer who is today often such an important member of a ship's staff has no definite legal status at sea. There is no provision of law to give assurance that the operator of electrical equipment on shipboard is properly qualified. This is the subject which Mr. Pierce deals with in his interesting paper. He recalls that the first installation of a dynamo on shipboard was in 1879 and the first important power installation at sea was completed in 1894. Rules for the installation of lighting were not issued until 1891 and for power not until four years ago. The Diesel engine, now accepted as one of the most efficient and reliable means of ship propulsion, has given great impetus to marine electrical development. Experience has shown electrically driven auxiliaries to be so efficient and satisfactory that their use is constantly and rapidly increasing, even where steam or steam electric propulsion is employed.

The Steamboat Inspection Service of the Department of Commerce requires steam and Diesel engineers to have had experience in the operation of such machinery, and issues licenses only after they have satisfactorily passed an examination and proved that their training has been adequate. For electrical engineers there are no such requirements. Generally a licensed ship's engineer is entrusted with the supervision of the electrical machinery.

The author contends that the electrical knowledge of most of the licensed ship's engineers is inadequate and that numerous cases are on record where damage or danger has resulted. He quotes several notable instances. The paper concludes with suggestions for remedial legislation and reviews the general nature of the problem.

### The Internal Combustion Turbine

*By W. J. Goudie, D.Sc. Published by the Institution of Engineers & Shipbuilders in Scotland, Glasgow.*

This is a technical review of the principles underlying the problem of this type of turbine. The author states that the advance in the knowledge of combustion gases and liquid fuels, designs of turbine details and production of special temperature-resisting materials has rendered the prospects of the production of a practicable internal-combustion turbine much more favorable than they were before. The early attempts to build such machines ended in failure, partly on account of lack of knowledge, but largely through lack of suitable material.

In referring to Holzwarth's work the author cites authorities to show that some of this inventor's theory is erroneous and the calculated results based on it are unreliable. He acknowledges, however, that there is much valuable information to be obtained from a cautious study of Holzwarth's book on the gas turbine.

Dr. Goudie is of the opinion that unless metallurgists make a big advance in the production of material that will retain high tensile strength at high temperatures, and unless designers of turbo-compressors can increase the compression limits and the efficiency of that type of pump, there is no immediate prospect of an internal combustion turbine which can compete successfully with the reciprocating type of engine in the matter of efficiency.

Anyone interested in the possibilities of the development of this type of engine will find the subject covered pretty thoroughly in Dr. Goudie's paper.

### The Motorship in the Light of the History of Marine Propulsion

*Presidential address of Sir Westcott S. Abell, K.B.E., Chief Surveyor to Lloyd's Register. Published by the Institute of Marine Engineers, London.*

In dealing with this subject the president of the Institute of Marine Engineers combined the commercial, engineering and historical aspects in a concise review. He showed by means of a chart that the development of the motorship in its 14 years of ocean use measures up well when compared with the supplanting of sail by steam. How rapidly the percentage of motorships has been increasing in the quarterly records of new ship construction was illustrated in a diagram similar to that which has occasionally been used in this magazine to drive home the same fact. As a measure of the gains to be had from the use of Diesel engines in marine propulsion Sir Westcott Abell offered a diagram comparing the proportions of a ship's displacement given over in a steamer and in a motorship to hull weight, machinery weight, fuel weight and cargo-weight, respectively. In another diagram he gave the proportions of cubic space taken up by tanks (ballast or oil), machinery, coal bunkers and holds, respectively in a steamer and in a motor vessel. A historical chart indicating fuel consumptions, boiler pressure, temperature of steam and exhausts from 1820 to 1920 showed how slow steam developments had been and assisted the author to predicate the possible limits of steam progress. Another interesting chart used was based on the relation between fuel consumption in tons per day of a 2000 s.hp. engine and the brake thermal efficiency of the triple expansion engine, turbine, ordinary Diesel and Diesel with waste heat reclamation. It showed that further progress in economy can only be made slowly. The description of these charts and diagrams conveys the scope of the address, which may be summed up as a scholarly consideration of the motorship as a unit in the development of the world's shipping.

### Marine Oil Engine Trials Committee Reports

*First Report; Trials of the T. S. M. V.* SYCAMORE; *Second Report, Trials of the T. S. M. V.* DOLIUS. *Published by the Institution of Mechanical Engineers, London, England.*

Since the issue of the report on the second motorship tested by the Marine Oil Engine Trials Committee in England it has become possible to appraise the nature of the trials conducted and the character of the data gathered for publication. Each report in itself constitutes a reference to the performance of a particular type of engine. The series of reports, when complete, will furthermore supply a basis of comparison between various types of installations in ships of about uniform size.

In order to get the significance of the trials being made by this committee one should note the purpose and constitution of this body. It was originally formed to take advantage of the offer made by a British marine engineering company to place at the disposal of the Institutions of Mechanical Engineers and of Naval Architects an oil-engined ship of 6000 tons d.w.c. for testing at sea in any way desired. The two institutions got together and decided to appoint a joint committee, to which was later added a representative of the Institute of Marine Engineers and a representative of the Admiralty.

The committee decided to make as many of the engine tests as possible ashore, in order to reduce the period of time that the ship would have to be held for trial purposes, every day at sea representing an additional burden to the owners of the vessel. The shore tests were planned to have a definite relation to the sea tests, and the sea tests themselves were arranged to provide information on the propulsive efficiency of the vessels, as well as on the

(*Continued on page* 379)

Generated on 2024-09-13 15:34 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN

## Recent Technical Reports and Addresses

(*Continued from page* 374)

maneuvering ability of the main and auxiliary machinery.

It was the Furness Withy twin screw motorship SYCAMORE which formed the subject of the first trials. She is driven by 6-cylinder 4-cycle engines of the Beardmore-Tosi type built by Richardsons, Westgarth. The second vessel to undergo similar tests was the Alfred Holt twin screw ship DOLIUS equipped with 4-cylinder 2-cycle Scott-Still engines.

In order to convey more clearly the points of similarity and the differences between these two vessels, some of their leading characteristics are set out in the table on this page.

### Characteristics of Two Motorships Submitted for Test

| | SYCAMORE | DOLIUS |
|---|---|---|
| Owners | Furness Withy & Co. | Alfred Holt & Co. |
| Length b.p. | 363 ft. 0 in. | 400 ft. 0 in. |
| Breadth molded | 52 ft. 0 in. | 52 ft. 0 in. |
| Mean draft (loaded) | 23 ft. 0 in. | 25 ft. 9 in. |
| Displacement (loaded) | 9200 tons | 11,533 tons |
| Deadweight capacity | 6000 tons | 8100 tons |
| Service speed | 11.5 knots | 11 knots |
| Power | 2500 s.hp. | 2500 s.hp. |
| Revolutions | 125 r.p.m. | 120 r.p.m. |
| Propeller diameter | 12 ft. 0 in. | 12 ft. 0 in. |
| Propeller pitch | 10 ft. 6 in. | 9 ft. 9 in. |
| Blade area | 50 sq. ft. | 48 sq. ft. |

There are two sections to each report, the first dealing with the machinery and the second with the ship. Drawings show the layout in the engine rooms and the space occupied by the machinery. Diagrams are given also of the position of the propellers.

While this information has a restricted interest in a single report, the interest is increased when comparison becomes possible between two or more reports. For instance, in the case of the two reports under review it develops that the length of the engine room of one vessel is 60 ft. while that of the other is only 40 ft., plus the thrust recess. Both ships have fuel capacity for about 20,000 miles, but due to the difference in the fuel consumption of the two different types of engines about 200 tons greater bunker capacity is required in one of them. In respect to machinery weights it is shown that there is a difference of about 130 tons in the main engines, but slightly less than this in the total machinery weights due to differences in the system of auxiliaries.

Sections are given of the main engines and detailed drawings of the injection valves and fuel pumps. For each engine it is then shown at what speeds the various trials at full load, three-quarter load, half load and quarter load have to be carried out in order to correspond to the equivalent torque at the ship's propellers.

Of the actual engine trials a mass of data has been assembled in convenient form. In most cases the tables of readings and the calculations made therefrom are accompanied by curves showing the results graphically. The first table sets out the conditions of the tests with regard to duration, engine speeds, brake loads, etc., and is followed by a table showing the quantities of fuel consumed at different loads and expressed in different terms, e.g., per hr., per min., per i.hp.hr., per s.hp.hr., etc. The next table gives the readings of the absorption dynamometer with the calculations of brake hp., brake m.e.p., etc. Sample indicator cards are reproduced and the deductions therefrom are tabulated, showing not only mean indicated pressure but also the pressures at the end of compression and at the end of expansion. To illustrate the practical interest of this it may be stated that while one engine shows an average pressure of 455 lb. per sq. in. at the end of compression and 92 lb. per sq. in. m.i.p. at rated load, the other type of engine has a compression of about 355 lb. and works with about 76 lb. per sq. in. m.i.p. at rated load.

These indicator diagrams are not reproduced with the care and attention that one expects to find in a technical report issued by such an important committee. In the case of the SYCAMORE trials the committee itself confesses in an early part of the report that "the lead of the cord was not particularly satisfactory and the cards are therefore unlikely to bear close analysis." The sketch of the indicator drive shows considerable room for improvement. The compression and expansion curves of the diagrams do not show fair curves, but this may be due to lack of care in tracing them for reproduction.

It is well, however, to suggest that all the data obtained from the indicator cards be accepted with reserve, because one finds that the mechanical efficiency of the SYCAMORE'S engine at rated power is calculated to be practically 80 per cent. This figure is higher than one would expect to find in an engine of this power and of this class. Whatever errors are introduced into the report through the indicating do not destroy the usefulness of the report, but they do detract from the value of this particular section of the tests.

In the trials of the DOLIUS engine the indicator drive was of a more satisfactory type, and there does not seem to be the same reason for questioning the accuracy of the deductions made from the indicator measurements, but the reproductions of the diagrams leave room for improvement, the tracing apparently being at fault.

When one studies the curves of fuel consumption there is again a doubt raised in the case of the SYCAMORE engine trials. The fuel consumption shown on one of the tests is not plotted, because it does not fit in with the fairness of the fuel consumption curves. The best consumption was at rated power and equal to 0.425 lb. per b.hp.-hr. On the other hand the fuel consumption curve as plotted does not show a better consumption than 0.45 lb. per b.hp.-hr. One is left wondering what this means. It is scarcely credible that this engine cannot show a fuel consumption of 0.425 lb. per b.hp.-hr. at rated power. Yet, if one accepts this figure, the rest of the fuel consumption curve is open to question.

The DOLIUS engine has a very remarkable fuel consumption graph. It is entirely flat between about 800 hp. and 1400 hp. with a uniform consumption of just over 0.35 lb. per b.hp.-hr. This is a low figure which cannot be entirely explained by the fact that this is a compressorless engine and that extra power is developed in the steam cylinders through the agency of the exhaust gas of the engine, but must be partly attributed to excellent fuel injection.

The thermal efficiency of the DOLIUS engine on the basis of total b.hp. is shown to be as high as 46 and 47 per cent. In these trials measurements were of course made of the exhaust gas temperatures at several places, of cooling water temperatures and quantities at different parts of the engines, and exhaust gas analyses were carried out.

In the case of the SYCAMORE engine complete measurements were also made on the blast air compressor showing the power absorbed on different stages and giving the delivery pressures and temperatures, also the delivery of the various stages, together with indicator diagrams and cooling data.

The DOLIUS engine has no injection air compressor, but it required a special series of readings to show how part of the exhaust gas heat was reclaimed and how the steam thereby provided was utilized. From the heat balance sheet it appears that the steam end of the DOLIUS engine provided about 10 per cent of the total power obtained from the engine.

In the sea trials difficulties were evidently encountered in loading the ships sufficiently to put the engines under full power at their rated speed. This was particularly true of the DOLIUS. Nevertheless, the data furnished regarding the actual displacement, block coefficient on that basis, etc., affords pretty good basis for future comparisons. When more reports of this series have been published it will be useful to endeavor to bring the ships' performances to a common basis.

During the sea trials of the SYCAMORE tests were made to measure the adequacy of the starting air storage capacity, but these were omitted in the case of the DOLIUS. A record is also given of the trials to determine the response of the engines to the maneuvering orders. In both vessels about 25 quickly repeated orders were given to the engine room and were carried out satisfactorily. These were not confined merely to the reversing of the engine but were extended to cover the speeding up of a pre-arranged number of revolutions.

The reports furnish useful data to engine builders and afford information that will be of interest to shipbuilders and ship operators.

---

## Relative Commercial Efficiency of Internal Combustion and Steam Engines for High-Speed Passenger Vessels

*By Sir John Biles. Published by the Institution of Naval Architects, London, England.*

This paper, read at the spring meeting of the Institution, is being more widely reprinted in the British magazines than any other technical paper published during the last year. The reason for the prominence given to it is not clear. Its contents do not seem to justify such publicity. The paper is obviously intended to give prominence to the proposed new high pressure steam turbine system, with 500 lb. pressure and a temperature of 700 deg. Fahr., for which the author accepts a fuel consumption of 0.7 lb. per s.hp.-hr., which he compares with 0.5 lb. per s.hp.-hr. in a Diesel installation. His comparison between the AORANGI and two turbine steamers of the same size and speed, one of which has a high pressure turbine system, does not seem to lead anywhere. Tables of figures are given, but no definite summing-up is undertaken. The author goes as far as he can to praise steam and damns the Diesel with faint praise. At the end of the paper is an appendix containing data on a dozen motorships operating in freight services. This has nothing to do with the subject of the paper, but nevertheless it is there. Included in the table are two ships with engines of identically similar type, and the cost per b.hp. given for one is 30 per cent higher than the cost quoted for the other. One is left wondering what the explanation is.

---

A very clear illustration of the manner in which the tonnage laws, which are very nearly the same throughout the world, prevent motorships from gaining the benefit of the reduced tonnage measurements to which the saving in machinery space entitles them is shown in the case of the latest B. & W. vessel BORGESTAD. The builders point out that in this ship, which is 350 ft. long, the entire length of the engineroom is only 35 ft. The ship thus has about 20 per cent more cargo space than could be obtained in a steam driven vessel of similar dimensions. An even greater gain of cargo space could, however, have been obtained if the tonnage laws would not have penalized such a step. The engine room space has been reduced to 13 per cent of the ship's total cubic. If any further reduction had been made the ship could not have obtained her 32 per cent deduction of the gross tonnage. It will probably take years to have this situation remedied by the governments concerned.

Generated on 2024-09-13 15:34 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN

# Sketches and Working of Oil Engines*

## The Cylinder as the Focus of Power Generation—Good and Bad Ways of Packing the Liner

A GENERAL survey of the way in which the cylinders of an oil engine are held in the framework of this type of prime mover has just been concluded. As far as can be learned from observation and from a study of the evolution of framework, it appears likely that the objective sought by designers is not the prevention of rupture, but the avoidance of deflections and of misalignments due thereto.

Springing of the framework may be caused by engine loads originating in the cylinders and reacted to by the main bearings. If there is enough properly disposed metal to keep deflections within suitable limits the assurance against breakage is probably ample. Ruptures of oil engine framework, except where gross errors in design have been committed, are as a matter of fact among the rarest occurrences. Long before the structure of an oil engine would break because of insufficient metal sections the machine would probably have suffered a general operating breakdown caused by heating and scoring of misaligned parts.

Some of the difficulties which have in the past arisen in connection with engine cylinders have undoubtedly been actually due to defects in framing design. However, in view of the fact that the construction of suitable engine framework no longer presents any serious problems, attention may properly be focussed on the cylinder itself and the method of supporting it be considered as settled.

Within the space of an oil engine cylinder are concentrated a good many of those power generating functions ordinarily associated with the furnace, bridge-wall, steam-space and cylinders of a steam installation. In a general way of speaking, the combustion end of an oil engine cylinder is supplied with raw fuel and with the air for burning it, while at the same time it is called on to perform those functions which in the case of a steam plant are carried out in the engine proper.

Probably one of the reasons why it was possible for the human race to solve the problem of steam power as early as a century ago is that this class of machinery lent itself to the splitting-up of the functions which it performs. In a steam installation there is a separate place for the fire and the clinkers (the boiler flue), and besides that the distilling process of raising steam allows nothing but the purest imaginable working medium to reach the fitted working parts of the engine.

The fact that no such separation is possible in the oil engine will be considered a handicap by some. Nevertheless the union of the essential power-generating functions within the cylinders of oil engines is perhaps also the secret of their far greater efficiency and compactness. At any rate there appears to be little likelihood that progress will be reserved. As in many other instances the problem had to be faced, willy-nilly, and now that it has been substantially solved there will be few to weep over the early disappointments which it caused.

Instead of having a separate and specially adapted place for itself, the fire of an oil engine is built directly within the mechanism. But it is not only with respect to the internal fire that the oil engine cylinder differs from that of the steam engine cylinder. As has already been pointed out, high pressures, in addition to the heat, must be allowed for. At the same time mechanical requirements, such as the maintenance of a good working finish on the interior cylinder surfaces, must be met. No one is interested, of course, in the kind of surface which the fire leaves on the inside of a boiler furnace. In an oil engine cylinder a good accurate surface must be preserved in the face of pressure and heat.

Mention has been made of the fact that the pressures occurring in oil engines are roughly three times as high as those encountered in ordinary steam engine practice. Among the various metals which come into question for oil engine cylinders, cast iron holds front rank. It possesses the twin qualities of wear-resistance and ability to withstand heat in so marked a degree that the two together more than compensate for the mechanical weakness of this metal. As far as resisting the pressures is concerned, steel would no doubt be superior, but its wearing properties are none too good under ordinary conditions and impossibly bad under the normal conditions within an oil engine cylinder.

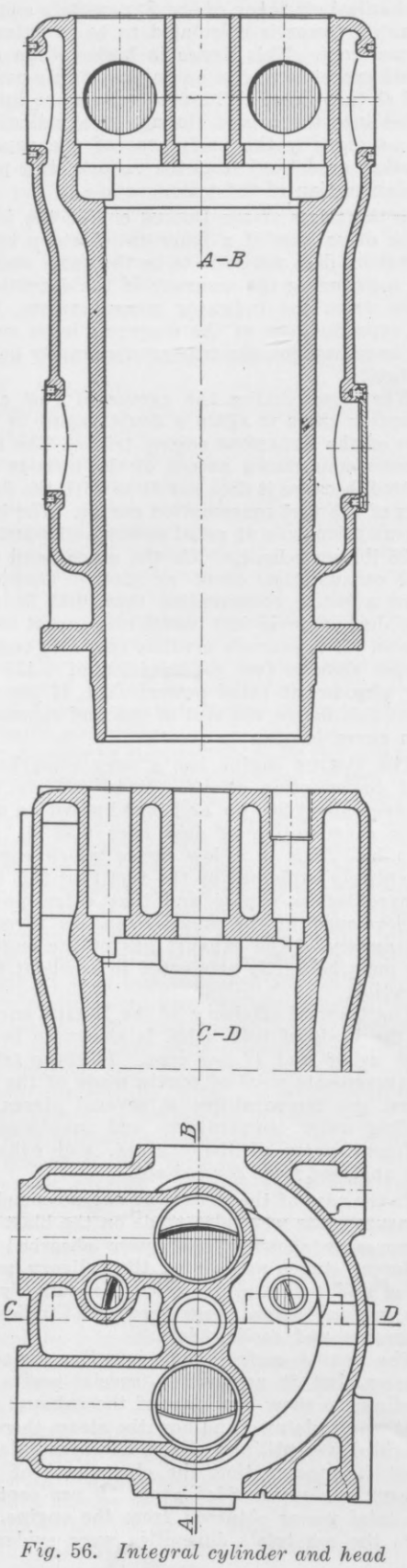



*Fig. 56. Integral cylinder and head*

An interesting example of an attempt to unite the good wearing qualities of cast iron with the strength of steel is illustrated in Fig. 57. Note that only so much of the cylinder as is necessary for taking the wear of the piston rings is made of a cast iron liner, while the actual combustion space of the cylinder is bounded largely by forged steel surfaces. An attempt to use an all-steel cylinder on an engine of another make failed completely because it was found impossible to prevent its surface from roughening and deteriorating rapidly. In the design shown in Fig. 57 it will be noted that the cast iron liner has walls of a thickness insufficient to withstand the pressure by itself; in combination with the surrounding steel, however, the strength is ample. The cylinder wall in this rather special design is made up of three layers—the two already noted and the outer shell for the water jacket.

In most cases, however, an oil engine cylinder consists merely of the actual inner cylinder and the water jacket surrounding it. Gas and automobile engine practice has accustomed us to thinking of the two as cast in one. For smaller oil engines the integral casting is also the rule. Such a design (Fig. 56) has some striking advantages, chief among which is the absence of anything like a flanged joint near the upper end of the cylinder where the heat due to the combustion is most intense. The integral casting permits a free flow of water around all the heated parts with the result that it is not difficult to keep them at moderate temperatures.

The integral cylinder calls for simpler machining operations than the one which has a separate inserted liner. Without the latter there are no accurate fits and no high-pressure joints to make and to take care of during operation, a fact which tends to reduce both manufacturing and maintenance costs. Owing to the high pressures ordinarily occurring in the cylinder, the gain which results from the elimination of the separate cylinder head and the heavy studs necessary for holding it down is considerable. In one respect the machining is not so favorable and that is with regard to the main boring operation. Owing to the fact that there is only a small hole in the end of the cylinder, it is impossible adequately to steady the boring bar inserted from the other end, and this machining operation is therefore apt to be a delicate process.

Among the reasons which some designers have for favoring the separate cylinder liner, one of the more important is its freedom to expand endwise. While the inner cylinder is exposed to the combustion and gets warm in spite of the effect of the cooling water, the outer jacket remains considerably cooler and therefore does not expand as much as the liner. For this reason it becomes difficult to use integral-cast cylinders with a bore much above 12 in. if the risk of cracking the water jacket is entirely to be avoided. In any case the difference in strain caused by the unequal

*Summary of a course of instruction at the Polytechnic Institute, Brooklyn, N. Y., by Julius Kuttner, B. Sc., Licensed Chief Engineer, Associate Editor of MOTORSHIP. This is the fifth chapter, the first one having appeared in the January, 1925, issue.

Generated on 2024-09-13 15:34 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN

temperatures makes it somewhat uncertain as to how the endwise pressure load on the cylinder is being divided up.

In casting an integral cylinder the shifting of either the central or the water jacket core by a relatively slight amount may seriously affect the thickness of the inner wall which remains after boring. As the means for positively detecting such a shift are limited the chances for failure in service are increased. On the whole, an integral casting is apt to be more complicated, and the percentage of defectives is therefore likely to be higher. After a cylinder is worn out and must be replaced it becomes necessary to scrap the entire casting, whereas if the water jacket is separate only the liner need be replaced.

Modern methods of manufacture may, however, require a considerable revision of the above criticisms. Particularly if cylinders of moderate power and rating are considered and if they are machine-molded on a quantity basis the problems of keeping down defectives in manufacture and of preventing failures in operation are considerably reduced. One manufacturer who uses integral-cast cylinders will part-credit a customer with a wornout cylinder and will furnish him with a newly-bored cylinder and piston fitted to it probably in less time and at smaller expense than would be involved in jacking a worn liner out of a two-part cylinder and fitting a new liner and piston.

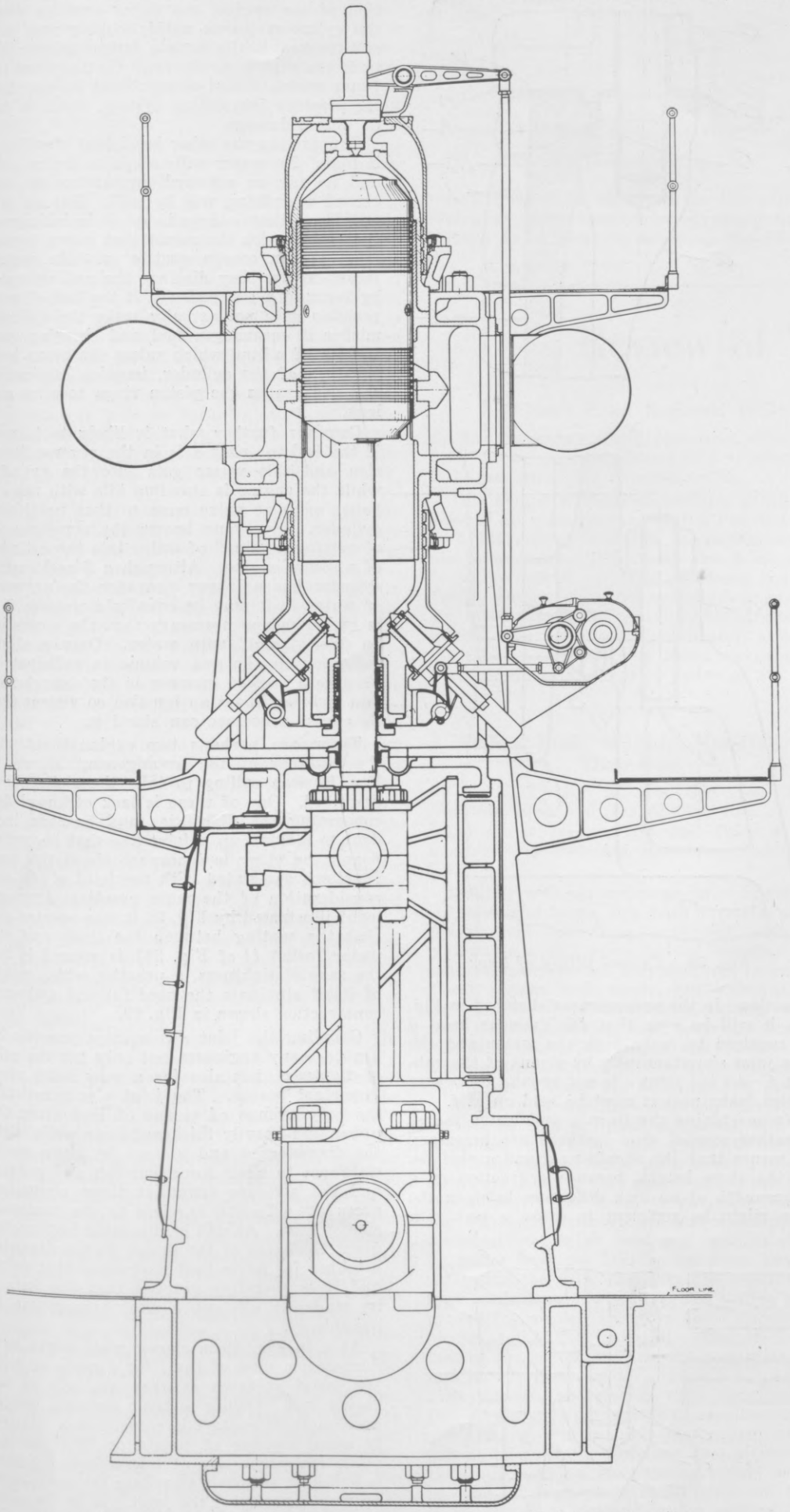



*Fig. 57. Combination of cast iron and steel in cylinder construction*

Without attempting here to decide categorically in favor of the one or the other type it is perhaps not out of place to call attention to an advantage which is claimed for the separate liner and which has a direct bearing on the further study of the subject. The liner is generally a simple casting, the thickness of the walls of which may more readily be checked as to uniformity, irrespective of whether it be machined on the outside or not. A dense hard grade of iron such as would be less likely to pour well in the more complicated integral mold may be employed, and will probably afford better resistance to the wear of the piston and rings. At the same time a softer gray iron better suited for the water jacket may be used.

A typical method of fitting a cylinder liner is shown in Fig. 58, in which $n$ represents the box frame or crank case and $a$ the water-jacket. As the upper surface $u$ of the box-frame and its corresponding under surface (not shown) are both planed in such a way that parallelism to the crankshaft centerline is insured, it suffices for the alinement of the cylinder that the flange $q$ be properly bedded to the surface on which it rests. The flange $q$ is faced off at the same setting of the boring bar used for machining the diameters $y$, $k$, and $m$, with the result that no special squaring-up is needed to insure that the centerline of the cylinder shall be at right angles to the crankshaft. Care is generally taken to remove the burrs raised around the threaded stud-holes $p$, and for the purpose of locating the cylinder mid-way between the crank-cheeks a wire is sometimes run through the cylinder.

Note that the centerlines of the studs $p$ are located as close to the jacket wall as will permit using a wrench on the nuts, and that the load transmitted by them is taken up by a deep section of the box-frame casting located directly underneath them. Clearance is of course provided in the stud-holes through the water-jacket flange, and after the latter has been shifted sidewise to the proper position it is frequently fixed in place by means of dowels fitting in reamed holes.

In a good many instances the separate liner $b$ is fitted to the water jacket $a$ before the latter is set down on the box-frame. Whereas the diameter $y$ is generally made a light push fit, the diameters $k$ and $m$ are given a fairly liberal clearance to allow for the expansion and growth of this highly heated cylinder end. Cast-iron, it will be recalled, has a way of enlarging permanently under the influence of heat, and if this fact be neglected it may become a hard drive fit in the upper bore of the water jacket. Aside from the difficulties which can thus be put in the way of jacking out the liner for the purposes of replacement the growth may actually be enough to burst the outer jacket. The clearance at $m$ and $k$ may vary from 1/64 in. to 1/32 in. depending on the bore of the engine.

Making the high-pressure joint $g$ between the cylinder head casting $c$ and the liner is one of the important matters to look after in this general type of construction. Heavy studs $d$ are used for holding down the cylinder head against the gas pressure amounting to something like 500 lb. per sq. in. The stress in the studs—generally eight in number—reacts through $g$, urging the flange of the inserted liner hard against the shoulder $j$.

Generated on 2024-09-13 15:40 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN

Whereas a copper gasket is frequently used at *g* to retain the hot combustion gases, the joint *g* is in many cases ground in with emery grinding compound and no yielding packing material used on it. Besides preventing the escape of cooling water out of the jacket *l* the ground joint *g* is important for transmitting heat from the walls of the liner.

It may already have suggested itself that there is a considerable difference between the outer diameter of the head *c* and the cylinder bore *z*. Many persons, in fact, are surprised when they see a Diesel engine cylinder head opened up for the first time and note how small the actual bore is in comparison with the metal which surrounds it. It has been observed in a preceding chapter that the center distance between the cylinders of an oil engine is determined largely by the consideration of getting some kind of clearance between the tangencies of the adjacent cylinder heads. As far as the lengths of the crankshaft journals and the thickness of the crankwebs are concerned smaller center distances than those commonly found could be used.

Starting from the effective cylinder bore *z* it is not difficult to trace the steps by which the designer is forced to work into larger and larger diameter as he takes care of all the necessary conditions. The dimension *m*, for instance, must be such as to give adequate liner thickness near the upper end for resisting the bursting pressure of the combustion; to that must be added the width of the joint *j*. Naturally the bolt circle *w* is chosen as small as is consistent with the avoidance of breakage between the tapped stud holes and the diameter *k*. Once *w* has been determined, the extreme cylinder diameter is fixed by the size of the nut on the stud and by the metal bosses surrounding the lower stud ends.

A considerable reduction in the diameter of the studs would be possible were it not for the fact that they must be capable of withstanding not the total pressure load on an area determined by the effective cylinder bore *z*, but by the cylinder head area encompassed by the diameter of the gasket *g*. The latter, in turn, is determined by the necessity of getting around the valve clearance pockets *v*, which must be provided if exhaust and inlet valves of adequate diameter are to be employed.

Clearance is provided at *e* and *h* between the cylinder head and jacket *a* and liner *b* respectively, in order that the force of the studs may positively be applied to the joint *g*. Soft annealed sheet copper is generally provided for this joint, although copper-asbestos and asbestos fiber gaskets are less frequently used. Owing to the fact that copper is appreciably hardened as the result of mechanical straining such as it gets between the joint faces, annealing before re-use is to be recommended whenever the joint is opened up. Any fibrous gasket used in this location is apt to be made brittle and papery by the squeezing and the heat. In the experience of the writer plain metallic copper has been found best in the long run. Cutting out such a gasket by means of a tin shears from the copper sheets is apt to be an awkward undertaking, because the metal is distorted and "kinked" by the shears. A good stock of spares from the factory is the best remedy for this difficulty.

Much of what has just been discussed may be more readily understood and remembered by bearing in mind that the insertion of the separate liner makes it necessary that two joints be packed and made tight. On the one hand the cylinder head must close off the end of the liner in such a way as to prevent the escape of somewhat corrosive and highly heated gases under pressure, and on the other hand leakage of cooling water past the seating of the liner in the jacket must be rendered impossible.

Lack of clear thinking on the subject is evident on some of the designs met with in

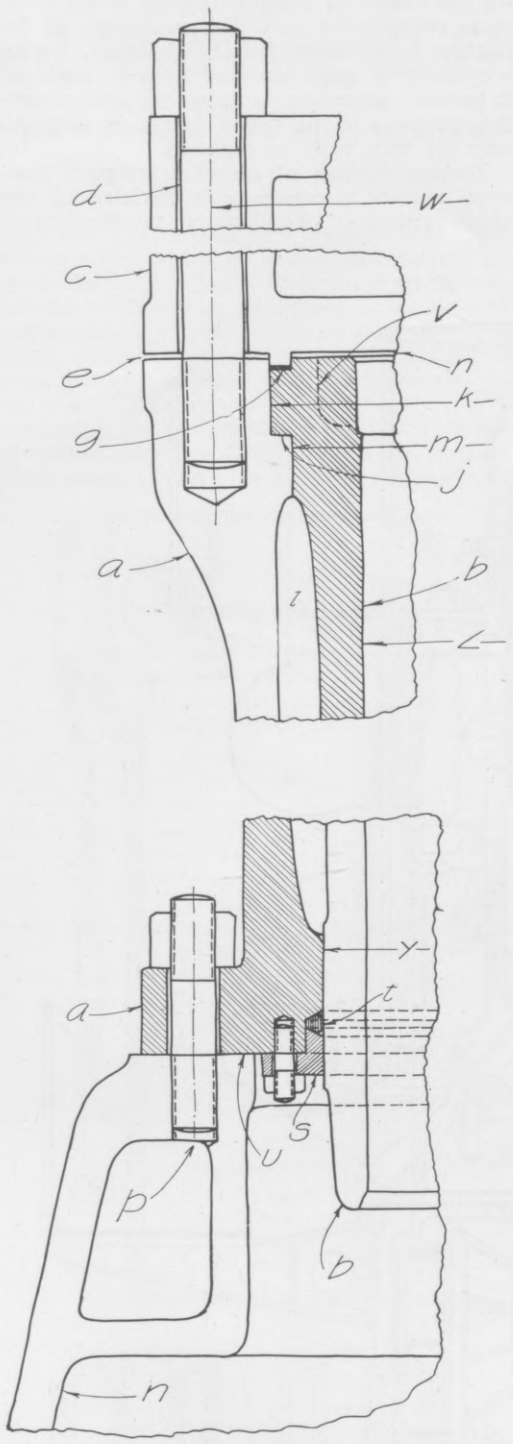



*Fig. 58. Typical fitting of liner*

practice. In the arrangement sketched in Fig. 59, it will be seen that the cylinder head *g* is required to make both the water and the gas joint simultaneously by means of the rabbet *f*. As the joint *e* is not ground the water which leaks past it must be held up at *f*.

In machining the liner *h* and water jacket *j* rather special shop methods are necessary to insure that the shoulders *d* and *c* shall be of the same height, because a fraction of a thousandth of an inch difference between the two might be sufficient to cause a leak if a

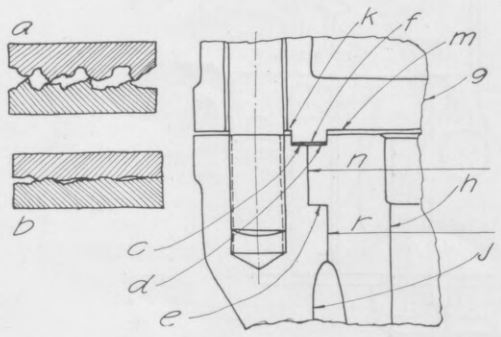



*Fig. 59. Single rabbet joint for head*

relatively hard copper gasket were used under *f*. Yielding fibrous gaskets, with the exception, perhaps of klingerit, have generally been found inferior to the metallic type. If *d* be the higher of the two, the escape of gases from *m* will be insured against, but water will leak past the loose joint *c* into the clearance *k* and thence down the sides of the cylinder. Although this condition does not apparently constitute a serious interference with the operation of the engine, the water running down the cylinders leaves untidy-looking rust and salt tracks. Really serious danger to the safety of the engine results from the fact that the water trickle almost always finds its way into the pressure lubricating system, where it can do untold damage.

Suppose, on the other hand that shoulder *c* is high. No water will escape to the outside, and as far as outward appearance is concerned everything will be well. But as *d* is now lower than *c* there is apt to be leakage at that point, with the result that gases coming from *m* can escape past *e* into the water-jacket, where they displace the cooling water by forming a gas pocket. If the loss of compression does not actually make the cylinder misfire it encourages foul and sluggish combustion of a kind which raises the mean temperature of the cylinder, impairs lubrication and encourages the piston rings to stick and leak.

Consider further what is likely to happen if the leakage past *d* is in the reverse direction and salt water gets into the cylinder while the engine is standing idle with the exhaust or inlet valve open to that particular cylinder. Everyone knows the consequences of getting a "slug" of water into the cylinder of a steam engine. Although a Diesel engine cylinder has a larger clearance the presence of water in it may be equally disastrous. It is by no means necessary that the clearance be filled "solid" with water. Only a slight reduction in the gas volume is sufficient to produce a marked increase in the compression and to bring about an ignition so violent that no engine structure can stand it.

There are perhaps two explanations why the designer of the arrangement shown in Fig. 59 was willing to take the risks above described. One of these is lack of knowledge concerning the difficulties and hazards incident to making up a joint like that shown at *f* and the other is ignorance about the dual functions associated with the joint *e*. In our consideration of the more practical arrangement illustrated by Fig. 58 it was pointed out that the seating between the liner and the water jacket (*j* of Fig. 58) is ground in for the sake of tightness, a practice which would of itself eliminate the need for the awkward construction shown in Fig. 59.

Grinding the joint *e* is made a practice by a good many engineers not only for the sake of tightness, but also for a very much more important reason. The joint *e* is practically the only avenue of escape of heat from the upper and heavily thickened liner walls. Both the diameters *n* and *r* must be given ample clearance to allow for expansion and growth, and the air-gaps found at these circumferences are effective barriers to the transmission of heat. As will be discussed further, the great thickness of the flange on the diameter *n* makes for acute heat distress at that point, and it is therefore esential that the joint *e* be made as efficient a heat transmitter as possible.

At *a* in Fig. 59 is shown what might be a microscopic view of the joint *e* made up with the metal surfaces as they are left by the facing tool. Owing to their essential roughness, metallic contact is secured at a relatively small number of points or "high spots," while the proportion of microscopic air gaps is sufficient seriously to reduce the heat-transmitting capacity of the joint. If on the other hand good contact has been established as the

Generated on 2024-09-13 15:37 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN

result of grinding with emery compound, a considerably greater aggregate surface becomes available for the all-important purpose of transmitting heat (*b*, Fig. 59).

Whatever type of joint is used at the upper end of the liner, it is generally of such a kind that it precludes endwise movement of the liner barrel at that point, and, if endwise expansion due to heat is to be allowed for, a suitable type of packing must be provided at the other end. One of the more common arrangements for such a bottom-end joint is illustrated at *s*, Fig. 58. As it is not complicated by the proximity of a high-pressure gas joint, it involves no special problems other than those created by the tangled thinking of some designers.

Water pressures rarely exceed 50 lb. per sq. in., and they are readily taken care of by means of the more or less standard form of gland ring shown at *s*, Fig. 58. As the lower end of the liner *r* has an endwise motion of only a few thousandths of an inch considerations such as wear on the packing *t* do not arise. If there be leakage, a replacement of the packing *t* or the substitution of a thicker packing ring easily stops it. The ring *s* is independent of the liner *r*, of the frame *n* and of the water jacket *q*, and there is nothing to prevent manipulating it in the same way as is done with thousands of pump and piston rod glands. It is to be borne in mind, of course, that leakage at this joint is a serious matter, because of the contamination of the main lubricating system of the engine which may result.

A variation from the type of joint just discussed is illustrated in Fig. 60. As in the previous case there is the lower end of the cylinder liner *b* and the frame or water jacket *c*. In response to heat expansion and other influences *b* must be capable of moving slightly relatively to *c*, while at the same time the escape of cooling water at *d* must be prevented. In contrast to the previous arrangement the liner *b* does not extend through the joint as one piece, but is fitted with the extension or skirt *j* to permit of a downward removal of the engine piston. The extension also takes the place of the gland follower and is intended for making up the packed joint indicated at *e* and *f*.

A consideration of primary importance in this arrangement is of course the maintenance of the alignment between *j* and *b*, as can be safely done only by insuring positive metal-to-metal contact at the joint face *g*. The beveled groove *e* was originally filled with rubber having a formed cross section shown enlarged at *r* and fitting the recess *e* neatly. A bronze follower ring was laid in at *f* for the purpose of transmitting pressure from the skirt *j* to the rubber.

Depending upon normal variations in the machining of the groove *e* and of the ring *f*, the latter would either extend slightly beyond the surface *c* as shown at *m*, or it would be slightly below the surface as sketched at *l*. Differences in the size of the rubber also enter.

Before going any further with the study of this particular type of joint it may be well to recall one of the properties of rubber which is rarely brought to the engineer's attention. Like any non-gaseous and non-porous substance it is essentially incompressible. A disk of rubber accurately fitted to the end of a cylinder could probably be compressed very little more than if it had been water. Rubber is pliable and may be deformed by the application of relatively small forces, but compressing it is another matter.

Failure to give due consideration to this fact is chiefly responsible for the trouble which the joint shown in Fig. 60 gave in service. That it would leak if the dimensions of its component parts were such as to throw the top of the bronze ring *f* below the surface *c* is obvious. On the other hand, if the bronze ring

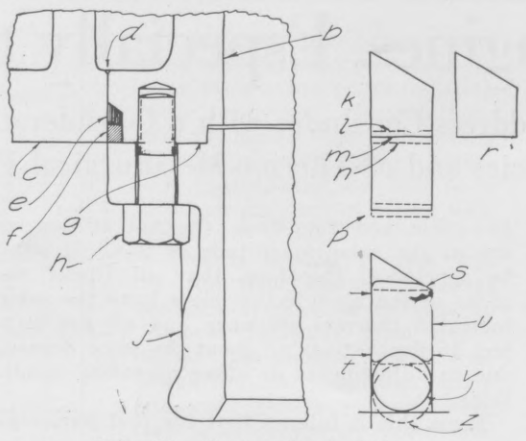



*Fig. 60. Lower joint of liner*

was a trifle high, as shown in the enlarged sketch at *p*, no amount of straining at the bolts *h* could properly make up the joint *g*. There were 16 1¼-inch bolts like the one shown at *h*, while the rubber *f* was only ½ inch wide, but a crew of four men using 4-foot pipes on the bolt-wrenches frequently failed to haul the skirt home and to close up the joint *g*.

Considerable improvement in the working of the joint was brought about by the substitution of a ring having a round cross section for the square-sectioned bronze ring, as shown at *v*, Fig. 60. It was possible to let the ring protrude appreciably above the surface without preventing the subsequent hauling down of the skirt. Instead of requiring the compression of the rubber, its deformation as indicated at *t* was brought about. The same principle was further applied by using square-sectioned rubber *u* in place of the kind indicated at *r*. There was room for it to be deformed into the bevel of the groove, and it probably exerted the pressure necessary for tightness at some point such as *s*.

(*To be continued*)

# Review of Technical Books

## Fireman's Fund Register, 1925

*By the Fireman's Fund Insurance Company. 9 in. x 6 in. 200 pp. Issued free of charge at the head office, San Francisco, Cal.*

This annual publication contains a full register of all vessels owned on the Pacific Coast, with dimensions, tonnage, managing owners and home ports. It includes also a lot of information useful to those operating boats in Pacific waters. The pilotage and towage rates are given for all the principal harbors on the Pacific Coast of the United States, a list of the Coast Guard stations, radio compass stations, drydocks and marine railways, etc.

## A Pocket Book of Ship Materials and Their Uses

*By H. H. Thayer, M. Am. Soc. Nav. Arch. and Mar. Eng. and Ass. M. Am. Soc. of Nav. Eng., 4¾ x 7½ in., 386 pp. Price 4 dols. Published by Simmons Boardman Publishing Co., New York.*

Dealing with all materials in ordinary use on ships and boats, this book forms a useful compendium for those entrusted with the maintenance and operation of vessels. The contents comprise not only chapters on metals, metal fittings and woods, but embrace also sections for wood substitutes, calking materials, canvas and felt, deck coverings, cement, insulating materials, ropes and blocks, bituminous compositions, bottom compositions and paints, etc. What the book actually gives is a summary of the knowledge on this subject current in well equipped shipyards, and it is presented in a broad and discursive manner, with only such technical data as are needed to define qualities. Where specifications are given the authority for them is generally named. Mr. Thayer is, however, no blind worshipper of specifications: in at least one case we notice he states that the best specification can not safeguard the shipowner like the selection of a manufacturer whose produce has been proved to be good and who has a reputation to maintain. Nor does Mr. Thayer incline toward the use of any but the best materials, and in this direction is perhaps too exacting. For instance, he remarks that Diesel engine fuel oil piping is preferably of seamless drawn steel tubing, and he adds that copper piping cannot be used for ordinary fuel oil service. Certainly seamless steel tubing should always be used for high pressure oil lines, but there is no reason to demand it for suction lines. Brass piping is accepted as good practice for fuel oil suction lines in Diesel engine installations, and the only reason why copper piping is not used for the purpose is that it is expensive. Throughout this book there is evidence of a conservatism that is frequently lacking in other technical works. One gains the impression that the author has not incorporated in this volume any statements that he could not definitely check and rely upon. A comprehensive and convenient index has been added, which is of real help in finding details.

---

A paper on the new Diesel engined 3-inch suction dredge of the Long Bell Lumber Co. will be read at the regional meeting of the American Society of Mechanical Engineers at Portland, Ore., from June 22 to June 25.

---

## Trunk-Piston Engines Gaining Favor

It is noteworthy that since the first set of B. & W. light engines, in which crossheads are dispensed with, was installed in the m.s. CRUX during the summer of 1923, great favor has been shown toward this type by some shipowners. There are already in service six cargo boats of between 6800 and 8000 tons d.w. capacity with engines of this trunk-piston type. The Danish passenger boat FREM and the Japanese passenger boat KURENAI MARU have similar machinery. The passenger ship now building for the North Sea service between Esjberg, Denmark, and Harwich, England, will be equipped with machinery of the same type. Orders are in hand for 13 cargo boats in which this type of engine is to be fitted. This makes a total of 22 boats in service or under construction with B. & W. trunk-piston engines, and yet only 20 months have elapsed since the first vessel of this character was put into commission.

---

## Turbo Driven Wire Brush

For driving wire brushes used in scaling of ships, cleaning castings, etc., a portable air turbine motor has been developed. It operates at speeds between 12,000 and 18,000 r.p.m., being mounted on ball bearings, and is geared through a single or double reduction to the low speed shaft, to which the brush is attached. This motor has an aluminum casing and its total weight is about 9½ lb. without the brush. The device is being manufactured and sold by the Standard Turbine Corp., Scio, N. Y.

Generated on 2024-09-13 15:35 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN

# Large Oil Engines, Especially the D-A Type*

## Dr. Lucke's Address Concludes with a Consideration of Thermal Efficiencies and of Thermo-Metallurgical Problems

INDICATED thermal efficiency is independent of the mechanism of the engine, being wholly a question of fuel combustion in relation to compression and expansion of the working gases, so that for similar combustion-chamber conditions, engines of all four classes would have the same indicated efficiency and fuel consumption.

Whatever actual differences there may be in fact must be traced to gas sources or gas-temperature relations to combustion chamber walls. It is therefore a matter of considerable importance to check up and determine to what extent it may be true that actual differences in fuel consumption of Diesel engines are due substantially or actually to their differences in mechanical losses just discussed.

On thermodynamic grounds the adiabatic Diesel air cycle yields results for thermal efficiency as a function of cut-off as was the case for indicated mean pressure, so that indicated efficiency becomes a function of indicated mean pressures. The results of such a calculation are given below.

TABLE 8—INDICATED THERMAL EFFICIENCY (AIR CARD)

| *Cut-off* | *Mean Pressure* | *Efficiency* |
|---|---|---|
| 3..... | 17.15 | 0.587 |
| 6..... | 34.16 | 0.565 |
| 9..... | 50.76 | 0.544 |
| 12..... | 67.50 | 0.521 |
| 15..... | 83.95 | 0.508 |
| 18..... | 99.70 | 0.489 |
| 21..... | 116.00 | 0.476 |
| 24..... | 132.40 | 0.458 |
| 27..... | 148.36 | 0.441 |
| 30..... | 164.19 | 0.428 |
| 33..... | 179.64 | 0.413 |

The cut-off corresponding to a given amount of heat liberated is, as was the case for indicated mean pressure, a function of the initial temperature of the charge and of the heat suppression, the increase of specific heat at high temperatures playing its part. Combustion in a cylinder is, moreover, never at a constant pressure and probably never completed at the time expansion begins, as practically all indicator cards by the slope of their expansion lines show evidence of some after-burning, but the amount is or can be the same in all cylinders working with air injection.

For reasons of this sort actual thermal efficiencies must be lower and are lower than the air-card values, and the relation is still the subject of study and speculation as to the individual effect of the several causes.

From various sources test values of indicated fuel consumption have been collected and converted into equivalent thermal efficiencies (based on the high calorific value of the fuel) in Table 10. In some cases the higher calorific power was not reported and for these it was estimated at the value 1.06 times the low value, which is probably as close to the truth as the accuracy of determination of indicated horsepower, a quantity always justly suspected. The fuel consumptions, which are always given, are plotted on the same sheet (Fig. 25) with the thermal efficiencies for graphical comparison.

Reference to the curves shows fair agreement between the trend of the lines for actual indicated thermal efficiency and at values represented roughly at 0.8, excluding some abnormally high values, a fact that gives additional weight to thermodynamic calculations and invites further study of such comparisons.

Variations in these results for any one engine, due to fluctuation of operating conditions in spite of care to hold them steady, are of the same order of magnitude as differences between two engines, and differences between two-cycle and four-cycle thermal efficiencies are of the same magnitude or less. It must be concluded, therefore, that all Diesel engines of the air-injection class have the same indicated thermal efficiency and all are subject to fluctuations of about the same degree, due to adjustments or other operating conditions.

From this it follows that the fuel consumption per net or brake horsepower-hour will be determined by the mechanical losses, and as these are less in the double-acting than in the single-acting engines, it must follow that double-acting engines are more efficient than single-acting.

It appears, therefore, that by developing the double-acting cylinder for large oil engines there is not only a material reduction in weight or cost for more or less identical machine design, especially frame types and materials of construction, a lesser number of cranks needed with a subsequent shortening of engine or reduction of floor space, and a very considerable increase in power for a cylinder of same bore, but that in addition there is a gain in fuel economy. It also appears that the two-cycle double-acting engine exceeds in aggregate advantages the double-acting four-cycle engine, though in the matter of fuel economy they are equal.

It remains now to examine the question of wall heating and to compare the limits of heat-generation rates of these four classes for a given bore or horsepower capacity per cylinder with the corresponding maximum for bores, or power per cylinder.

### Heat-Generation Rates and Metal Protection

As a result of heat generation in the combustion chamber, the walls of cylinder liner or cylinder proper, the cylinder head and piston head, all of which in large engines have circulating water or oil on their backs, will become hotter on the gas side due to heat reception, in spite of conduction to the liquid. The body of the metal will have a mean temperature higher than the liquid, and there will be a straight-line temperature differential between the liquid side of the metal and the gas side up to the face metal on the gas side. Experimental measurement by metal temperatures by properly made and properly applied thermocouples proves this beyond question. There is, however, a rational certainty of another temperature condition at the inner face for which satisfactory experimental data are lacking. This condition is due to the fact that the heat is received by the metal at a fluctuating rate, which must cause a periodic rise and fall of the temperature of the inner skin in much the same manner qualitatively as in the brick of furnace regenerators. In the latter, temperature measurements are comparatively easy because the period of fluctuation is half an hour, more or less. These measurements prove conclusively the existence of a temperature wave of maximum amplitude at the face, decreasing as the heat flows through the brick, and finally being damped to constancy at some distance from the face. In the regenerator brick the face is alternately heated by hot waste gases and cooled by incoming air, thus making the face temperature rise regularly above and below the mean steady value at the interior. The conditions are very similar in the metal of the combustion chamber walls in spite of the fact that here the skin temperature fluctuates always above the steady temperature in the body metal beyond the skin. It must fluctuate at the face and a steady value only a short dis-

TABLE 10 INDICATED THERMAL EFFICIENCY AND FUEL CONSUMPTION

| No. | Engine | Bore, in. | Stroke, in. | R.p.m. | I.m.p. | Lb. oil per I.hp. | B.t.u. per lb. | B.t.u. per I.hp.m. | Indicated thermal efficiency |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Diesel Engine Users Assoc'n | General | | | | 0.416 | 18,000 | 7490 | 0.34 |
| 2 | Still two-cycle | 22 | 36 | | 88.9 | 0.372 | | | 0.34 |
| | | | | | 81.2 | 0.353 | | | |
| 3 | Sulzer two-cycle | 25.2 | 41.73 | 100 | 114 | 0.289 | | | |
| | | | | | 63 | 0.282 | | | |
| | | | | | 37 | 0.278 | | | |
| | | | | | 92 | 0.292 | | | |
| | | | | | 72 | 0.278 | | | |
| 4 | Burmeister and Wain | | | | | | | | |
| | 1418 Hp. | | | | | 0.326 | | | |
| | 2299 Hp. | | | | | 0.302 | | | |
| | 3178 Hp. | | | | | 0.306 | | | |
| 5 | Beardmore-Tosi | | | | | 0.326 | | | |
| 6 | Camellaird-Fullagar | 18.5 | 25.0 | 115 | | 0.28 | 19,200 | 5370 | 0.468 |
| 7 | British Admiralty experimental four-cycle | 14.5 | 15 | 380 | 126 | 0.31 | 19,400 | 6000 | 0.42 |
| | | | | | 114 | 0.28 | | 5420 | 0.465 |
| | | | | | 100 | 0.28 | | 5420 | 0.465 |
| | | | | | 90 | 0.28 | | 5420 | 0.465 |
| | | | | | 76 | 0.27 | | 5220 | 0.48 |
| 8 | Doxford air-injection, submarine, two-cycle | 20 | 20 | 300 | 130 | 0.32 | | | |
| | | | | | 126 | 0.30 | | | |
| | | | | | 107 | 0.29 | | | |
| | | | | | 98 | 0.29 | | | |
| | | | | | 87 | 0.28 | | | |
| 9 | Nobel, two-cycle | 26.58 | 38.98 | 106 | 63.1 | 0.288 | 19,100 | 5500 | 0.458 |
| | | | | | 74.0 | 0.304 | 19,100 | 5790 | 0.436 |
| | | | | | 90.7 | 0.312 | 19,100 | 5950 | 0.423 |
| | | | | | 85.1 | 0.33 | 19,100 | 6290 | 0.401 |
| | | | | | 72.1 | 0.312 | 19,100 | 5950 | 0.423 |
| | | | | | 57.0 | 0.304 | 19,100 | 5790 | 0.436 |
| | | | | | 54.7 | 0.302 | 19,100 | 5750 | 0.437 |
| | | | | | 61.0 | 0.314 | 19,100 | 6000 | 0.421 |
| | | | | | 74.5 | 0.293 | 19,100 | 5580 | 0.451 |
| | | | | | 92.0 | 0.307 | 19,100 | 5850 | 0.430 |
| | | | | | 92.0 | 0.327 | 19,100 | 6120 | 0.403 |
| | | | | | 98.5 | 0.33 | 19,100 | 6290 | 0.401 |
| | | | | | 107.5 | 0.342 | 19,120 | 6530 | 0.387 |
| 10 | Fraser-Chalmers, four-cycle | 21.5 | 22 | 300 | 108.0 | 0.308 | 19,120 | 5900 | 0.431 |
| | | | | | 85.4 | 0.294 | 19,120 | 5610 | 0.451 |
| | | | | | 64.8 | 0.278 | 19,120 | 5300 | 0.478 |
| | | | | | 48.3 | 0.523 | 19,120 | 4840 | 0.526 |
| | | | | | 49.0 | 0.251 | 19,120 | 4800 | 0.530 |
| | | | | | 107.7 | 0.306 | 19,120 | 5850 | 0.435 |
| | | | | | 120.5 | 0.321 | 19,120 | 6150 | 0.414 |
| 11 | Sulzer, two-cycle | 26.77 | 47.24 | 95 | 21.7 | 0.296 | 19,100 | 5150 | 0.447 |
| | | | | | 43.5 | 0.299 | 19,100 | 5700 | 0.442 |
| | | | | | 65 | 0.306 | 19,100 | 5820 | 0.432 |
| | | | | | 87 | 0.312 | 19,100 | 5930 | 0.425 |
| | | | | | 109 | 0.323 | 19,100 | 6160 | 0.410 |
| 12 | M. A. N., four-cycle | 15.75 | 23.62 | 160 | 117.0 | 0.35 | | 6660 | 0.378 |
| | | | | | 97.6 | 0.338 | | 6420 | 0.392 |
| | | | | | 77.5 | 0.324 | | 6190 | 0.408 |
| | | | | | 59.8 | 0.310 | | 5900 | 0.427 |
| | | | | | 38.5 | 0.324 | | 6190 | 0.408 |

*Continued from p. 298, April issue.

Generated on 2024-09-13 15:37 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN

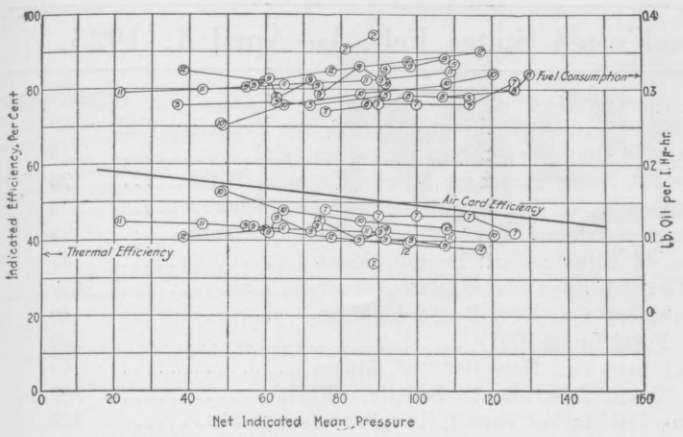



*Fig. 25. Indicated Thermal Efficiency and Fuel Consumption*

tance from the face is experimentally established.

As the rate of heat generation rises by increase of speed or by increase of mean pressure in a given cylinder, there arises in every such cylinder a tendency to injure the metal. For every detail of construction there is a limiting diameter for a given mean pressure and speed, or for a given diameter a limiting mean pressure beyond which it is not safe to go because of cracks or burns which at that time appear. This is the main reason for the recognized fact that in large cylinders of cast iron the mean pressure for rating is never as high as it is possible to secure by combustion. It is also the reason for much intensive study of design of these parts, from which many new details have developed that have added much to reliability of these parts, especially those constructions in which one-piece castings have been replaced by multiple-unit members providing specifically for protection against injury. Each of these has contributed something to the satisfactory operation of large oil engines at higher ratings in larger cylinders than once was possible. Each, however, has its own limits and there still exists the need of further extension of the limits, even to the point, if possible, where metal injury ceases to limit the mean pressure to be carried, or to limit the diameter. Not until then will it be possible to build oil engines of any horsepower per cylinder that may be needed, subject only to adequacy of control of combustion conditions. Modern designs of water-tube boilers can generate steam at very high rates without injury to the metal, and it has been established that the only limit to such rates is in the furnace capacity to generate heat. This is the ideal for the oil engine: to devise structural arrangements, to select materials and to design the structural details of the heated parts, cylinder, piston, and head, with rod, so that they will be uninjured by heat at whatever rate it may be produced. The forged-steel cylinder and piston construction peculiar to the Worthington double-acting engine is a new development and marks a near approach to this ideal.

This being a fact, it becomes a matter of primary importance in large engines to consider this matter of metal injury with a view to devising improved structures or finding new materials, or both, and with the understanding that every little gain is worth while, even though the ideal of no limit to heating rate may still be far off.

It is not possible to analyze this phase of the problem by rational means alone. No formula can be set up that will give accurately the stresses or predict the heating-rate limit beyond which cracks or burns will occur for any part of an oil engine. This is due to the very great complexity of the stress-producing causes and their interrelation, which is so great as to defy formulations without assumptions of unfavorable validity. Real progress must be based on experience with each new fact analyzed as well as may be in the light of rational possibilities, and then checked and rechecked. In time such a procedure, starting with empirical formulations, will ultimately lead to rational expressions that give results not contradicted by the facts of experience but in accord with them.

This is a slow process, but in the meantime it becomes possible from time to time to discover remedies from qualitative analyses of facts that make for real progress. Many steps of this sort have been taken, as previously noted, and others will follow in proportion as the attention of the engineering profession becomes focused on the problem of permanence of metal walls enclosing high pressure air supporting the combustion of oil at high average rates in B.t.u. per hr. per sq. ft., and intermittently at rates expressed in terms of B.t.u. per injection per sq. ft. Some of the best suggestions may well come from engineers who have had no contact whatever with Diesel engines, but who have had experience in one of the hundreds of lines of activity in which protection of heated walls against injury is a matter of regular concern.

The two heat-rate units noted at once call attention to the fact that the metal-protection problem has two parts, which, while related, have a considerable degree of independence. The first is steady heat flow, and the second, heat-storage frequency. The first recognizes expansion stresses varying with the mean temperature of the metal, and with the temperature drop across the metal section that varies with the gradient in degrees per inch, and with the thickness. The gradient varies with the heat-generation rate, B.t.u. per hr. per sq. ft. The second recognizes that heat is stored in a metal layer at actual moments of generation, being received in part by hot gas contact and in part by direct radiation of the gaseous mass and of solid particles of dust, ash, or carbon, probably mainly the latter. This produces momentarily high interior skin temperatures lasting but very short periods of time, but regularly recurring more or less, as in the filament of a flashing incandescent lamp.

In direct contact with this high frequency and high temperature of skin there is a hot air charge in which oxygen weight per cubic inch is higher than in pure oxygen at atmospheric conditions because of the pressure of 35 atmospheres, more or less, that prevails. This may well be the direct cause of burning of metal in a manner somewhat like that of the oxygen cutting torch working through a cold bar but acting more slowly because of the very short periods during which the temperature necessary for the reaction exists and the promptness with which it is damped out by the cooler metal mass behind the skin. Confirmation of this is found in the fact that metal in the direct path of sprays is more rapidly burned than elsewhere, as should be the case due to greater intimacy of contact of the gases and the metal, the so-called scrubbing effect, added to local temperature excesses.

Independent of such burning there is necessarily a high degree of expansion effort of the skin metal, regularly followed by contraction according to frequency of injection. This produces an intensification of the thick-cylinder effect, which tends to make the inner metal fail before the outer main mass has taken its load. The appearance of the spider webs of fine cracks first noticed in large gas engines must be more or less closely related to this condition.

Remedies for both of these effects of high momentary skin temperatures may be found in more than one direction. The first is in the use of ductile instead of brittle metal, forged, rolled, or pressed metal instead of castings, and metal selected for appropriate yielding properties under load, without lowered, and preferably with higher, elastic limit. The second is in the reduction of the temperature of the main metal mass just back of the skin, the temperature above which the skin temperature fluctuates and which, being the base temperature, must fix the maximum when other things are equal. This is a matter of temperature difference through the wall and a function of heat-generation rate per hour per square foot and of thickness. The third is frequency reduction. For equal hourly rates per square foot the B.t.u. per injection per square foot will vary inversely with the number of injections per hour and the skin temperature likewise. Therefore, high injection frequency is most desirable, and it is for this reason that high-speed engines give less trouble from metal injury than low-speed engines at equal heat-generation rates. It is also the reason for the fact established by experience that two-cycle engines give less trouble than four-cycle for equal hourly generation rates, or, what is equivalent, may carry higher hourly generation rates with the same metal reliability in large cylinders than four-cycle engines.

The use of forged steel for cylinders and pistons instead of the traditional cast iron seems, therefore, by its ductility to contribute directly to the reduction of the inner-skin injuries of local stress failure and burning, and its adaptability to the two-cycle port-scavenged cylinder, requiring no complicated ports and valve housings that would make adoption difficult or impossible, also contributes to further reduction by increasing the injection frequency and reducing the skin-temperature peak to one-half.

There is, however, a further contribution of the steel wall toward prevention of injury of the two surface types through its direct effect on reduction of the temperature of the main metal mass. Such steel walls may be made thinner than cast iron just about in inverse proportion to the allowable working stresses which are three or more to one, depending mainly on the type of steel, of which there is now available a good range of choice. Other things being equal, the temperature drop would be one-third or less in steel walls than in cast iron for the same hourly rate of heat generation, or with the same temperatures that now prevail, three or more times the hourly rate would be permissible with a greater margin of metal stability, due to the ductility of the metal. Freedom from webs, ribs, or thickened sections common to castings, and especially when removable cylinder heads are used, adds still more margin.

With no doubt as to the inherent possibility of thin steel as a wall material for oil-engine combustion chambers, of reduction of wall-injury hazard at equal heating rates, or what is equivalent, an increase in horsepower per cylinder over cast-iron construction, it becomes a matter of considerable interest to estimate how much gain might be expected. As already pointed out, there is no really satisfactory way of doing this by any rational formulation, but it is possible to make an estimate based on certain assumptions that seem reasonable.

One such basis of estimating the increase in horsepower per cylinder that might be expected by the use of steel cylinders for double-acting, two-cycle engines, is that of assuming equal temperature differences through the wall to those now in successful use. That this is conservative is supported by the fact that no allowance is made for absence of localized stresses due to thick spots or irregular sections, nor for the ductility of the material. To carry through such an estimate, however, other assumptions must be made for several other factors that appear in the formulation.

Generated on 2024-09-13 15:33 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN

## MOTORSHIP's List of Oil Engined Boats Registered in the United States Feb. 1—April 1, 1925.

| NAME OF VESSEL | GROSS | LENGTH | DEPTH | BREADTH | SERVICE | OWNER AND ADDRESS | HORSEPOWER |
|---|---|---|---|---|---|---|---|
| DEL MONTE | 15 | 42.2 | 12.4 | 5.5 | Fishing | International Fish Co., 535 Washington Street, San Francisco, Cal. | 50 |
| DEL RAY | 14 | 42.2 | 12.4 | 4.4 | Fishing | A. M. Googina, 556 Clay Street, San Francisco, Cal. | 50 |
| KANAGA | 60 | 61.6 | 16.5 | 8.1 | Fishing | A. M. Nelson, 4121 North Sixteenth Street, Tacoma, Wash. | 90 |
| AMELIA | 98 | 81.0 | 18.7 | 8.8 | Fishing | P. E. Harris & Son, L. C. Smith Building, Seattle, Wash. | 165 |
| LEVIATHAN | 42 | 56.6 | 15.4 | 7.2 | Fishing | Carl Eide, Tongass Trading Exchange, Ketchikan, Alaska. | 75 |
| CHARLES M. FAUCI II | 23 | 49.6 | 13.3 | 5.5 | Fishing | Vincenzo Bono, 44 Fleet Street, Boston, Mass. | 45 |
| HAWAIIAN STANDARD | 1,217 | 210.0 | 36.1 | 14.3 | Tanker | Standard Oil Co., 225 Bush Street, San Francisco, Cal. | 600 |
| ELIZABETH M. FOLEY | 25 | 54.9 | 15.5 | 5.5 | Fishing | Hathaway Machinery Co., New Bedford, Mass. | 40 |
| BALBOA | 31 | 60.8 | 15.7 | 6.0 | Fishing | Joe C. Monise, Point Loma, Cal. | 100 |
| CLINTON | 40 | 61.5 | 15.3 | 8.1 | Fishing | Hathaway Machinery Co., New Bedford, Mass. | 60 |
| CHELSEA | 65 | 68.0 | 17.1 | 8.2 | Fishing | George Ehler, Wayne Apartments, Seattle, Wash. | 100 |
| CRESCENT NO. 1 | 85 | 61.7 | 22.5 | 6.4 | Freight | F. E. Booth Co., 110 Market Street, San Francisco, Cal. | 125 |
| A. G. LAUN | 111 | 81.5 | 20.8 | 9.8 | Towing | Arundell Corp., Baltimore, Md. | 375 |
| EL CAPITAN II | 118 | 100.0 | 30.0 | 3.4 | Ferry | S. B. McNeely, Natchez, Miss. | 120 |
| FANNIE | 57 | 75.4 | 16.9 | 7.8 | Freight | Fannie Powell, Winthrop, Mass. | 100 |
| DARING | 15 | 43.1 | 10.3 | 5.5 | Fishing | Wm. H. F. Reed, Decatur, Wash. | 40 |
| EVELYN M. GOULART | 58 | 71.0 | 20.5 | 8.2 | Fishing | M. J. Goulard, Gloucester, Mass. | 60 |
| NORLAND A | 47 | 59.8 | 16.3 | 6.7 | Fishing | Elling Arentsen, 1177 Dexter Building, Seattle, Wash. | 60 |
| FRED D. DOTY | 91 | 103.3 | 22.1 | 5.0 | Ferry | Bee Line Ferry Co., St. Petersburg, Fla. | 150 |
| COOLIDGE | 39 | 57.8 | 15.9 | 6.6 | Fishing | Carl Overby, Port Walter, Alaska | 50 |
| SHIRLEY M. CLATTENBERG | 47 | 68.3 | 17.1 | 8.0 | Fishing | Langsford & Pines, Gloucester, Mass. | 60 |
| ELEANOR | 81 | 104.3 | 15.0 | 8.1 | Fishing | Empire Fish Co., Boston, Mass. | 100 |
| MARY PIGEON | 31 | 60.8 | 15.7 | 6.2 | Fishing | A. Rodriguez, Monrovia, Cal. | 75 |

This list is carefully compiled from responsible sources but cannot be guaranteed complete or accurate.

It may therefore be concluded that, however interesting such estimates may be, they will be too speculative to form a basis of any sound prediction.

For the present it may justly be said that the steel cylinder does make it possible to increase the horsepower per cylinder just as does two-cycle adoption compared with four and double-acting compared with single, so that the combination of steel cylinder, two cycles and double acting seems to offer the widest prospect at present in this direction. It has also been shown by this review that it is in about the same position as to number of cranks, shaft length, and weight per horsepower, and with higher overall efficiency than obtain for single-acting engines.

TABLE 9—SCAVENGING MEAN PRESSURES
(See p. 297, April issue)

| *Engine* | *I.m.p.* | *Scavenging Pressure* | *S.m.p.* |
|---|---|---|---|
| Fullagar | 89.0 | ... | 4.9 |
| | 102.4 | ... | 5.11 |
| | 81.5 | ... | 5.4 |
| | 92.8 | ... | 6.96 |
| Sulzer | 82.5 | ... | 5.46 |
| Nobel | 63.1 | 1.18 | 2.91 |
| | 74.9 | 1.17 | 2.90 |
| | 90.5 | 1.21 | 2.96 |
| | 100.1 | 1.35 | 3.17 |
| | 86.2 | .72 | 1.91 |
| | 72.1 | .71 | 1.90 |
| | 57.0 | .77 | 2.05 |
| | 53.3 | .45 | 1.26 |
| | 61.4 | 1.50 | 3.56 |
| | 74.3 | 1.50 | 3.36 |
| | 92.0 | 1.62 | 3.50 |
| | 98.5 | 1.59 | 3.48 |
| | 108.0 | 1.82 | 3.66 |

### Catalogs Received

*Alcuni vantaggi del Motori Diesel Marini*—A 20-page illustrated booklet covering the Burmeister & Wain type engine built in Italy, including a table showing the details of the numerous engines of this type now building in that country. Stabilimento Tecnico Triestino, Trieste, Italy.

*Boston Speed Reduction Units*—Dimensions, prices and brief descriptions of the small helical geared and worm geared speed reduction units standardized by the Boston Gear Works Sales Co., Norfolk Downs, Mass.

*Nobel-Diesel Engined Tanker* ZOROASTER—Performance on her first voyages, April-November, 1924. Svenska Aktiebolaget Nobel-Diesel, Nynäshamn, Sweden. (U. S. reresentative, Boris Hagelin, 43 Cedar Street, New York City).


### Classified Advertisements

50 CENTS PER LINE, 5 LINE MINIMUM, PAYABLE IN ADVANCE

*ENGINEER with years of experience in the designing, building and testing of internal combustion engines, from automobile to large oil engines. Has developed some important improvement, applicable to all types, and wishes to interest progressive manufacturers. Box No.* 622, MOTORSHIP, 27 *Pearl St., N. Y. C.*

*MOTORSHIP YEAR BOOK, 3d edition, a standard reference book of which a new edition has just been produced, still remains unexcelled for the completeness and accuracy of its information. The complete detailed record of motorships contained in this book is superior to any other list yet published anywhere in the world. Price $3 net, mailed free to any address in the United States or Canada.* MOTORSHIP, 27 *Pearl St., New York.*

*FOR SALE—100-hp. Fairbanks-Morse C-O Engine. A-1 condition. Louis Kunze, 415 Kahway Ave., Elizabeth, N. J. Phone Emerson* 8887.

*SACRIFICE—40-kw. Generating Set, 65-100 hp. Atlas-Imperial Diesel Engine, 3 cylinders. Direct connected to General Electric Navy Type Generator. Practically new, perfectly operating outfit. Good for 50% overload. Found too large for requirements and replaced with smaller unit. Equipment includes spare parts which cost* $1,200. *Price* $5,000 *crated, ready for shipment. Address Stanley M. Seaman,* 127 *West* 43*rd Street, New York.*

*POSITION desired as mechanical engineer in the designing and testing of Diesel engine, stationary and marine. Fifteen years' experience. Box No.* 623, *care* MOTORSHIP, 27 *Pearl St., N. Y. C.*

**JOHN W. SULLIVAN CO.**
**BRAND NEW DIESEL ENGINES**
**120-600 B.hp.**
***For Sale Cheap***
827 E. 9th Street New York City
Orchard 8500

**DAVID S. BECHTEL**
NAVAL ARCHITECT AND ENGINEER
DIESEL TUGS AND DREDGES
SAND AND GRAVEL PLANTS
SHIP BROKER
Bankers' Trust Bldg., 1315 Walnut St., Phila., Pa.
Engineering Bldg., 136 Liberty St., New York

**GEORGE G. SHARP**
*Naval Architect—Engineer—Marine Surveyor*
30 Church Street New York City
Motor Vessels
Design—Supervision—Survey
Tel. Cortlandt 5134 Cables SEACRAFT, New York

**Inspections Tests Reports**
**C. G. A. ROSEN**
Consulting and Research Engineer
DIESEL ENGINE DESIGNS
922 Rialto Building San Francisco
Phone, Douglas 655

**FOR SALE**—McIntosh & Seymour Diesel Engine, 960 I.H.P. complete with all necessary auxiliaries, including air compressor, electric generating auxiliaries, pumps, oil tanks, air tanks, propeller, shafting, thrust bearing, oil purifier, spares, etc. Ideal for installation in a Tug Boat, Steamship, etc. Can be inspected in New York Harbor.
**JOS. F. O'BOYLE, 15 Moore Street, New York City**


Generated on 2024-09-13 15:37 GMT / https://hdl.handle.net/2027/mdp.39015084660854
Public Domain / http://www.hathitrust.org/access_use#pd
Digitized by UNIVERSITY OF MICHIGAN
Original from UNIVERSITY OF MICHIGAN